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ARTICLE

Survival outcomes with pelvic node dissection after partial cystectomy among octogenarians with muscle-invasive bladder cancer

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AVUDAIAPPAN AP, PRABHAKAR P, BAKER H, ROY MK, OZAMBELA M, GOMEZ C, MANOHARAN M. Survival outcomes with pelvic node dissection after partial cystectomy among octogenarians with muscle-invasive bladder cancer. *Can J Urol* 2025;32(3):137–143.

Introduction: *Radical cystectomy with pelvic node dissection remains the standard of care for muscle-invasive bladder carcinoma (MIBC); however, there is a growing interest in bladder preservation alternatives among the elderly population. Guidelines indicate that partial cystectomy (PC) combined with pelvic node dissection (LND) can be considered as an alternative in carefully selected individuals. Using the National Cancer Database, we analyzed the overall survival (OS) between PC with and without LND among octogenarians.*

Methods: *We identified octogenarians with localized muscle-invasive bladder carcinoma (cT2-3N0M0) and urothelial histology who underwent PC with or without LND between 2004 and 2018. Based on the number of lymph nodes removed (LNR), the LND group was further subdivided into <10 and >=10 lymph node groups. A propensity-matched Kaplan-Meier survival analysis was performed to compare OS between these groups.*

Results: *Among 2573 patients who underwent PC, 492 octogenarians met our selection criteria. 208 (42.2%) had LND, while 284 (57.8%) had no LND. Within the LND group, 53 (25.5%) had <10 LNR, and 155 (74.5%) had >=10 LNR. The median OS for the matched LND and non-LND groups was 36.9 and 33.4 months ($p = 0.96$), respectively. Similarly, <10 LNR and >=10 LNR had 36.9 and 43.5 months ($p = 0.42$), respectively. Multivariate Cox regression analysis revealed no difference in the risk of mortality.*

Conclusion: *Among octogenarians who underwent PC, there was no significant difference in OS between those with or without LND, and between <10 or >=10 LNR groups. Therefore, the role and extent of LND after PC need further exploration in this subset of the population.*

Key Words: partial cystectomy, pelvic node dissection, muscle-invasive bladder cancer, elderly, octogenarian

Introduction

Bladder cancer is the 9th most common cancer globally and the 4th leading cause of death among those aged 80 and above in the United States population.[1,2] The median age of an individual at the time of bladder cancer diagnosis is 73 years, and among them, 20%–30% may have muscle invasion during diagnosis.[3,4]

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The life expectancy of the human population has been increasing over the years due to advancements in clinical care and overall improvement in global life expectancy. For those aged 80 years and above, life expectancy ranges from 8 to 10 years, with men and women having life expectancies of 7 and 9.1 years, respectively.[5,6] Therefore, understanding the outcomes of various treatment modalities in this age group of the population is important.

Guidelines suggest radical cystectomy (RC) with pelvic node dissection (LND) as the first-line treatment and suggest partial cystectomy (PC) with LND as a possible alternative in selected individuals with MIBC. Concerned about the limited life

expectancy and potential morbidities following RC, elderly individuals are considering bladder preservation alternatives. Studies in the literature have observed that 2.8% of patients with MIBC undergo PC, and PC in the elderly population with well-structured selection criteria may have a comparable overall survival (OS) to RC.[7–9] However, limited studies evaluate the role of LND after PC in the elderly population. LND plays an important role in tumor clearance and in measuring the disease burden, thereby acting as a guide in strategizing further needs for multimodal treatment. Yet, there is uncertainty on the extent of node dissection.[10] As pelvic node dissection carries potential adverse perioperative outcomes such as lymphocele and inadvertent vascular injury, with increased operating time and cost, a consensus on dissection guidelines, including template and the extent of lymph node yield, is being widely explored. This becomes particularly important when considering the risks and benefits of LND in octogenarians while optimizing their survival and quality of life. Hence, to understand the influence of LND on survival in the octogenarian population undergoing PC as a bladder preservation strategy, we used the National Cancer Database to compare the survival outcomes between those who underwent PC with and without LND.

Materials and Methods

Patient selection

We conducted a retrospective study using the National Cancer Database and identified those aged 80 and above with localized disease (cT2-3N0M0) and urothelial pathology between 2004 and 2018. Approximately 70% of all new cancer diagnoses in the United States are recorded in the National Cancer Database and maintained as a de-identified participant user file that is in line with the Health Insurance Portability and Accountability Act regulations. The integrity and reliability of the data are ensured with annual quality checks.[11,12] Since the data is deidentified and no human subject is directly involved, approval from the institutional review board (IRB) was determined as not required. We conducted the study according to the principles of the Declaration of Helsinki (2013 revision). Based on the treatment, the primary analytic cohort was divided into the LND group, which included patients who underwent PC with pelvic node dissection, and the non-LND group, which included patients who underwent PC without pelvic node dissection. Patients with variant histology, those treated with radical cystectomy, and individuals lacking follow-up data or details on pelvic lymph node dissection were excluded from the study.

Statistical analyses

We compared LND and non-LND groups by analyzing socio-demographic factors like race and ethnicity, gender, treatment centre, income, insurance status, and clinical factors like Charlson-Deyo comorbidity index, clinical T staging, and grade and size of tumor. We simplified race into white or black and ethnicity into Hispanic or non-Hispanic, as there were patients in other racial groups. We used Chi-square tests and contingency tables to compare clinical and sociodemographic parameters. To reduce the impact of confounders, we employed propensity matching using Mahalanobis distance. We matched the cohorts based on parameters like race and ethnicity, gender, Charlson-Deyo comorbidity index, treatment center, income, clinical T staging, and grade of tumor. We evaluated the survival outcomes using Kaplan-Meier analysis with log-rank tests and also performed a multivariate Cox regression analysis. A p-value of <0.05 was considered statistically significant. All statistical analyses were conducted using SAS software, version 9.4.

Results

A total of 671,462 patients were diagnosed with bladder carcinoma between 2004 and 2018, and 94,103 had localized MIBC. Among them, 492 octogenarians met our selection criteria and underwent PC with or without LND. In this population, 208 (42.3%) underwent PC with LND, and 284 (57.7%) underwent PC without LND (Table 1). The mean age of patients in the with and without LND groups was 84.0 ($\pm$3.2) and 84.6 ($\pm$3.4) years, respectively. Each group had 155 patients after propensity matching. In Table 1, univariate analysis showed LND was predominantly performed in academic centers and less often in community centers, 37% and 49.6% ($p < 0.001$), respectively. Most patients in the LND and non-LND cohorts had T2 tumors, 81.7% and 76.1%, respectively ($p = 0.13$). Among those who did not undergo pelvic node dissection, 28 (9.9%) received radiation, while among those who underwent pelvic lymph node dissection, 8 (3.8%) received radiation ($p < 0.05$). However, gender, income, treatment centre, Charlson-Deyo comorbidity index, clinical

TABLE 1. **Sociodemographic distribution of PC with and without PLND**

Variables	Unmatched population			Matched population		
	With PLND (N = 208)	**Without PLND (N = 284)**	***p*-value**	**With PLND (N = 155)**	**Without PLND (N = 155)**	***p*-value**
Age (Mean ± SD)	84.0 (±3.2)	84.6 (±3.4)	0.028			
Sex			0.852			1.000
Male	151 (72.6%)	204 (71.8%)		111 (71.6%)	111 (71.6%)	
Female	57 (27.4%)	80 (28.2%)		44 (28.4%)	44 (28.4%)	
Race			0.017			0.558
White	197 (94.7%)	254 (89.4%)		148 (95.5%)	148 (95.5%)	
Black	4 (1.9%)	22 (7.7%)		2 (1.3%)	4 (2.6%)	
Others	7 (3.4%)	8 (2.8%)		5 (3.2%)	3 (1.9%)	
Ethnicity			0.457			0.755
Non-Hispanic	194 (93.3%)	256 (90.1%)		142 (91.6%)	145 (93.5%)	
Hispanic	3 (1.4%)	7 (2.5%)		3 (1.9%)	3 (1.9%)	
Unknown	11 (5.3%)	21 (7.4%)		10 (6.5%)	7 (4.5%)	
Facility type			<0.001			0.142
Community CP	6 (2.9%)	26 (9.2%)		5 (3.2%)	14 (9.0%)	
Comprehensive CCP	89 (42.8%)	141 (49.6%)		74 (47.7%)	77 (49.7%)	
Academic	77 (37.0%)	52 (18.3%)		47 (30.3%)	38 (24.5%)	
Integrated Network CP	36 (17.3%)	65 (22.9%)		29 (18.7%)	26 (16.8%)	
Comorbidity index			0.286			0.063
CCI—0	132 (63.5%)	180 (63.4%)		104 (67.1%)	94 (60.6%)	
CCI—1	45 (21.6%)	70 (24.6%)		28 (18.1%)	46 (29.7%)	
CCI—2	17 (8.2%)	25 (8.8%)		12 (7.7%)	10 (6.5%)	
CCI >= 3	14 (6.7%)	9 (3.2%)		11 (7.1%)	5 (3.2%)	
Tumor grade			0.148			0.293
Grade II	4 (1.9%)	12 (4.3%)		4 (2.6%)	7 (4.5%)	
Grade III	80 (38.5%)	131 (46.1%)		64 (41.3%)	77 (49.7%)	
Grade IV	100 (48.1%)	113 (39.8%)		73 (47.1%)	59 (38.1%)	
Unknown	24 (11.5%)	28 (9.9%)		14 (9.0%)	12 (7.7%)	
Clinical T			0.130			0.100
cT2	170 (81.7%)	216 (76.1%)		127 (81.9%)	115 (74.2%)	
cT3	38 (18.3%)	68 (23.9%)		28 (18.1%)	40 (25.8%)	
Pathological T			<0.001			0.040
<=T1	11 (5.3%)	3 (1.1%)		8 (5.2%)	3 (1.9%)	
T2	59 (28.4%)	104 (36.6%)		47 (30.3%)	56 (36.1%)	
T3/T4	101 (48.6%)	93 (32.7%)		69 (44.5%)	51 (32.9%)	
Unknown	37 (17.8%)	84 (29.6%)		31 (20.0%)	45 (29.0%)	
Surgical margin			0.002			0.028
Negative	160 (76.9%)	179 (63.0%)		118 (76.1%)	97 (62.6%)	
Positive	36 (17.3%)	68 (23.9%)		28 (18.1%)	40 (25.8%)	
Unknown	12 (5.8%)	37 (13.0%)		9 (5.8%)	18 (11.6%)	

(Continued)

TABLE 1. **(Continued)**

Variables	Unmatched population			Matched population		
	With PLND (N = 208)	**Without PLND (N = 284)**	***p*-value**	**With PLND (N = 155)**	**Without PLND (N = 155)**	***p*-value**
Chemotherapy			0.065			0.003
Neoadjuvant	23 (11.1%)	18 (6.3%)		17 (11.0%)	12 (7.7%)	
Adjuvant	9 (4.3%)	26 (9.2%)		3 (1.9%)	19 (12.3%)	
Perioperative	7 (3.4%)	11 (3.9%)		4 (2.6%)	7 (4.5%)	
No Chemotherapy	169 (81.3%)	229 (80.6%)		131 (84.5%)	117 (75.5%)	
Radiation			0.011			0.004
Yes	8 (3.8%)	28 (9.9%)		6 (3.9%)	20 (12.9%)	
No	200 (96.2%)	256 (90.1%)		149 (96.1%)	135 (87.1%)	
LN Yield			<.001			
<10 nodes	155 (74.5%)	284 (100.0%)		–	–	
>=10 nodes	53 (25.5%)	0 (0.0%)		–	–	
30-Day Mortality			0.131			0.717
Alive	206 (99%)	273 (96.1%)		153 (98.7%)	154 (99.4%)	
Dead	2 (1.0%)	11 (3.9%)		2 (1.3%)	1 (0.6%)	
90-Day Mortality			0.545			0.827
Alive	195 (93.7%)	259 (91.2%)		144 (92.9%)	145 (93.5%)	
Dead	13 (6.3%)	25 (8.8%)		11 (7.1%)	10 (6.5%)	

Note. PLND, Pelvic Lymph Node dissection; CCI, Charlson-Deyo Comorbidity Index; CP, Community Program; CCP, Cancer Community Program; LN, Lymph Node.

T stage, tumor location, tumor grade, tumor size, chemotherapy, 30-day readmission, 30-day and 90-day mortality had no significant differences.

Kaplan-Meier analysis showed that the unmatched LND and non-LND population had a median OS (Figure 1A) of 38.8 (95% CI (Confidence Interval) 29.4–51.8) and 30.8 (95% CI, 24.6–37.0) months ($p = 0.19$), and the matched population (Figure 1B) was 36.9 (95% CI 27.4–51.8) and 33.4 (95% CI 26.6–42.8) months ($p = 0.96$), respectively. Similarly, based on the lymph node yield (Figure 2), the median OS of <10 LNR was 36.9 (95% CI 27.4–51.8), and >=10 LNR was 43.5 (95% CI, 27.3–55.6) months ($p = 0.42$), respectively. In the matched population, Multivariate Cox analysis (Table 2) showed no difference in the risk of mortality between <10 and >=10 LNR (HR (Hazard Ratio) = 0.88 (95% CI, 0.57–1.35)). However, comorbidity index 2 (HR = 2.38 (95% CI, 1.58–3.58)) had an increased mortality risk, and a negative surgical margin (HR = 0.44 (95% CI, 0.33–0.59)) had reduced mortality risk. Tumor size and its location, radiotherapy, chemotherapy, and tumor grade showed no difference in the risk of mortality.

Discussion

We observed that overall survival was comparable between patients who underwent PC with or without LND in the octogenarian population. Similarly, LND with an LNR of <10 and >=10 nodes had no significant difference in survival. LND was performed predominantly in academic centers, and a limited patients in the black population underwent LND. A higher proportion of patients who did not undergo LND received radiation. Multivariate Cox showed no difference in mortality risk between <10 and >=10 LNR. Similarly, 30-day readmission or 30-day and 90-day mortality had no statistically significant difference. However, a higher comorbidity index had an increased mortality risk, and a negative surgical margin had a reduced mortality risk.

Previous studies have demonstrated that when LND is done with PC for the treatment of MIBC, there is an improvement in overall survival and cancer-specific mortality.[13–15] A study by Lenis et al. demonstrates that LND <10 and >=10 nodes both resulted in an improvement in survival (HR = 0.62, $p < 0.01$ and HR = 0.48, $p < 0.01$), with most patients in the age group of 65–79 years.[13] In a study using

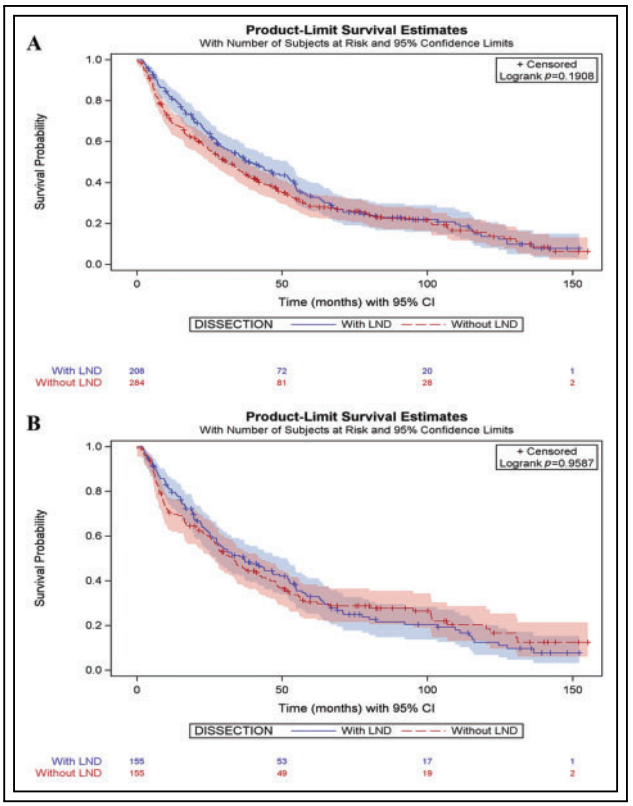

FIGURE 1. Comparison of overall survival between the unmatched (**A**) and matched (**B**) population of PC with or without PLND among octogenarians. LND, Pelvic lymph node dissection

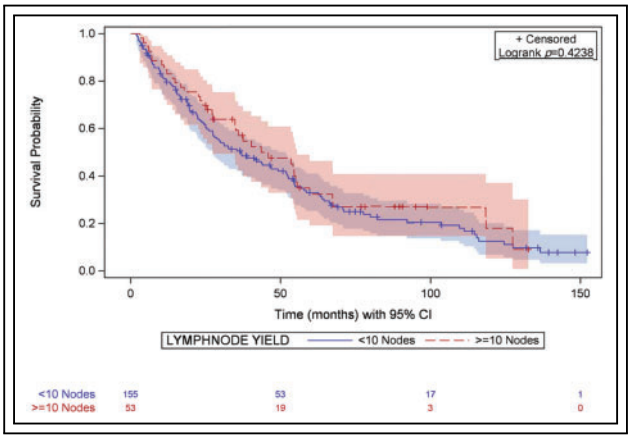

FIGURE 2. Comparison of overall survival based on lymph node yield in patients undergoing PC with PLND among octogenarians

TABLE 2. **Multivariate Cox regression for matched population**

Parameter	Hazard ratio (95% Confidence Interval)	*p*-value
Comorbidity index		
CCI 0	Reference	
CCI 1	0.92 (0.68–1.24)	0.5635
CCI 2	2.38 (1.58–3.58)	<0.0001
CCI >= 3	1.37 (0.76–2.45)	0.2936
Tumor grade		
Grade IV	Reference	
Grade I	0.45 (0.08–2.65)	0.3801
Grade II	0.86 (0.19–3.89)	0.8442
Grade III	0.96 (0.21–4.34)	0.9576
Unknown	1.51 (0.33–7.02)	0.5965
Clinical T		
T2	Reference	
T3	1.63 (1.20–2.22)	0.0016
Pathological T		
<=T1	Reference	
T2	2.25 (0.80–6.33)	0.1243
T3	2.53 (0.90–7.12)	0.0789
Unknown	2.82 (0.98–8.11)	0.0545
Pathological N		
N0	Reference	
N+	1.34 (0.73–2.47)	0.3411
Nx	1.15 (0.82–1.61)	0.4260
Unknown	1.12 (0.63–1.99)	0.6957
Surgical margin		
Positive	Reference	
Negative	0.44 (0.33–0.59)	<0.0001
Unknown	0.35 (0.21–0.58)	<0.0001
Chemotherapy		
Neoadjuvant	Reference	
Perioperative	0.70 (0.35–1.42)	0.3281
Adjuvant	1.29 (0.61–2.70)	0.5056
Unknown	1.46 (0.91–2.35)	0.1201
Radiation		
Yes	Ref.	
No	0.81(0.46–1.43)	0.4637
LN Yield		
<10 Nodes	Reference	
>=10 Nodes	0.88 (0.57–1.35)	0.5458

Note. CCI, Charlson-Deyo Comorbidity Index; LN Yield, Lymph Node Yield.

Surveillance, Epidemiology, and End Results (SEER) database, Minstretta et al. showed LND reduced cancer-specific mortality (HR = 0.57, $p < 0.001$), with a mean patient age of 73 in their PC cohort.[14] Klose et al. in their study observed that >15 LNR yielded a reduced mortality risk (HR = 0.78 and 0.54, $p <$

0.05), and the average patient's age in their study was 74 years. They also observed that the impact of LND on survival may be influenced by age (HR = 1.03, $p < 0.001$).[15] We studied the octogenarian population and observed that patients treated with or without LND had similar OS. Mistretta et al. in their study using the National Inpatient Sample database observed that LND during radical cystectomy had a marginally higher association with overall complications (OR (Odds Ratio): 1.23 vs. 1.32, $p < 0.001$) and extended length of hospital stay (OR: 1.08 vs. 1.20, $p < 0.001$) in octogenarians in comparison with younger patients.[16] In our study on PC, details on complications were unavailable, but the length of hospital stay, 30-day readmission, and 30-day 90-day mortality between the LND and non-LND groups had no significant difference. Grabbert et al., in their study on LND after RC among octogenarians, observed limited survival benefits from LND after RC.[17] Our study observed limited survival benefits from LND after PC in octogenarians. To our knowledge, this is one of the few studies that focus on the octogenarian population treated with partial cystectomy.

Although the lymph node yield of >=15 nodes showed a marginal increase in OS, it was not statistically significant ($p = 0.42$). This observational difference reflects findings from previous studies that demonstrate the association between higher lymph node yield and decreased cancer-specific mortality, but with a lag of benefits in the octogenarian population.[14,16] While studies have supported the general practice of pelvic node dissection when performing cystectomy for MIBC, there is a lack of unanimity regarding the ideal dissection template and the adequacy of lymph node yield. Additionally, most studies review the role of LND with radical cystectomy, with less investigation into its addition to partial cystectomy. This is possibly due to the concerns about PC on oncological outcomes, and a lower overall rate of LND when performing PC, as exhibited by a previous study reporting that LND was omitted 50% of the time.[15] This trend is similarly reflected in our study, with 42.7% of patients undergoing partial cystectomy having LND.

Our study had several limitations that should be considered while interpreting the results. First, this is a retrospective database-related study with a small sample size, which could inadvertently reduce the accuracy of the analysis. There is a lack of details on salvage RC and radiation in this population subset. Limited information on the extent of LND is available; hence, identifying the optimal adequacy of dissection with its potential complications is challenging. The study focuses on overall survival, as details on other cancer survival metrics like recurrence-free or cancer-specific survival were not available. As this subset of the population is vulnerable to functional decline, which could impact the recovery time, understanding the role of LND is crucial. Future prospective studies with larger sample sizes focusing on the role and extent of LND, and also on cancer-specific and recurrence-free survival, could offer greater insights and help increase the quality of life in this population subset.

Conclusion

Our study on pelvic node dissection after PC among octogenarians showed that LND was performed infrequently. However, there was no significant difference in overall survival between those with and without LND and between <10 and >=10 lymph nodes removed. Therefore, the role and extent of LND after PC need further exploration among this population subset.

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Author Contributions

Conception and design: Murugesan Manoharan, Arjun Pon Avudaiappan; Administrative support: Murugesan Manoharan, Christopher Gomez; Provision of study materials: Murugesan Manoharan, Manuel Ozambela Jr; Collection and data assembly: Pushan Prabhakar, Arjun Pon Avudaiappan; Data analysis and interpretation: Pushan Prabhakar, Arjun Pon Avudaiappan, Hannah Baker, Mukesh K. Roy; Manuscript writing: Arjun Pon Avudaiappan, Pushan Prabhakar, Hannah Baker, Mukesh K. Roy,

Manuel Ozambela Jr, Christopher Gomez, Murugesan Manoharan; Final approval of manuscript: Arjun Pon Avudaiappan, Pushan Prabhakar, Hannah Baker, Mukesh K. Roy, Manuel Ozambela Jr, Christopher Gomez, Murugesan Manoharan. All authors reviewed the results and approved the final version of the manuscript.

Availability of Data and Materials

This study was conducted using data from the National Cancer Database, which is available in the NCDB repository. http://www.facs.org/quality-programs/cancer/ncdb (accessed on 15 May 2025).

Ethics Approval

Since the data is deidentified and does not involve direct human subjects, approval from the Institutional Review Board (IRB) was determined as not required. We conducted the study according to the principles of the Declaration of Helsinki (2013 revision).

Conflicts of Interest

The authors declare no conflicts of interest to report regarding the present study.

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