

LETTER TO EDITOR

Sarcopenia predicts prognosis of bladder cancer patients after radical cystectomy: A study based on the Chinese population

Dear Editor,

Bladder cancer (BCa) is a common malignant tumor in the genitourinary system. Approximately 20-25% of BCa is muscle-invasive bladder cancer (MIBC), and MIBC is prone to progression and metastasis.¹ Radical cystectomy (RC) combined with lymphadenectomy is currently the most effective treatment for MIBC, which can maximize the patients survival time.² However, RC in partly damages intestinal function and affects metabolism. Studies have shown that RC can lead to a 5% weight loss and a 7-17% muscle mass loss in 2 weeks after operation.³ In addition, some research results shown that about 21-55% patients before RC have malnutrition, and malnutrition would increase overall mortality and cancer-specific mortality.⁴

Frailty, which results from the reduction of the reserve of physiological stressors in multiple organ systems, can increase postoperative mortality, infection rate, and readmission rate and reduce survival time and prolong hospital stay.⁵ Because of its immeasurability, it is difficult to identify frail individuals. At present, sarcopenia has been successfully used as an alternative indicator of frailty. Sarcopenia is a geriatric syndrome, which is characterized by a gradual decrease in strength, muscle mass, and physical function with increasing age.⁶

The study of sarcopenic in BCa is controversial. Smith et al⁷ retrospectively analyzed the clinical data of 200 patients who received RC and found that sarcopenic was a predictor of major complications after RC in women. Through a multicenter study, Mayr et al⁸ found that sarcopenic was an independent risk factor of overall survival (OS) and cancer-specific survival in RC patients. However, studies have reported that sarcopenic was not a factor related to the survival of BCa patients. By measuring the skeletal muscle index (SMI) of 146 patients, Fraisse et al⁹ found that sarcopenic was not relevant to survival (no matter OS, progression-free survival, and survival without readmission) or postoper-

ative complications in patients with localized MIBC. Stangl-Kremser et al¹⁰ reported that sarcopenic was not a prognostic factor for patients with high-risk bladder urothelial carcinoma who are not suitable for RC or systemic chemotherapy and who only receive radiation therapy.

In this study, 200 patients with BCa who underwent RC in the Department of Urology of Shanghai Tenth People's Hospital from March 2009 to October 2018 were analyzed retrospectively. The total psoas index (TPI) was used to evaluate the sarcopenia. TPI is the cross-sectional area of the two total psoas area (TPA) muscles passing through the third lumbar (L3) cone and is standardized according to the patient's height: $TPI = TPA / (\text{height [m]} \times \text{height [m]})$. According to the diagnosis of malignancy by the international consensus group, sarcopenia was diagnosed when the $TPI < 385 \text{ mm}^2/\text{m}^2$ for female patients or $TPI < 545 \text{ mm}^2/\text{m}^2$ for male patients.

TPI was used as a marker of sarcopenia. Sixty-seven (33.5%) of the 200 eligible patients were classified as sarcopenic and 133 (66.5%) as nonsarcopenic (Table 1). Compared with nonsarcopenic patients, patients in the sarcopenic group were older (68.7 vs 64.6 years; $P = .007$), longer hospital time (32.88 vs 29.19 days; $P = .011$), higher 3-year mortality (41.8% vs 24.8%; $P = .044$), higher 5-year mortality (44.8% vs 30.8%; $P = .001$), lower body mass index (BMI) (21.07 vs 24.62 kg/m^2 ; $P < .001$), lower hemoglobin (115.8 vs 124.3 g/L ; $P = .015$), lower albumin (37.5 vs 39.1 g/L ; $P = .488$), and lower survival time (31.20 vs 29.61 months; $P = .670$). There was a positive relationship between BMI and TPI ($R^2 = .1324$, $P < .001$; Figure S1A), and the median TPI in males was significantly higher than that in females (Figure S1B). Univariate and multivariate cox proportional hazard regression analysis showed that Tumour-Node-Metastasis (TNM) stage and sarcopenic (Figures 1A and 1B) were related factors of OS and disease-free survival (DFS) in BCa patients undergoing RC, and sarcopenic patients had better OS (hazard ratio (HR) = 0.47; 95%

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TABLE 1 Baseline characteristics with comparison between sarcopenic and nonsarcopenic patients when using TPI as an assessment tool

Characteristic	All patients No. (%)	Nonsarcopenic No. (%)	Sarcopenic No. (%)	P-value
Total patients	200	133 (66.5)	67 (33.5)	
Age, y, mean (SD)	66.0 (10.1)	64.6 (9.9)	68.7 (10.1)	.007
Age categorized (years)				.148
≤65	98 (49.0)	70 (52.6)	28 (41.8)	
>65	102 (51.0)	63 (47.4)	39 (58.2)	
Gender				.195
Male	173 (86.5)	118 (88.7)	55 (82.1)	
Female	27 (13.5)	15 (11.3)	12 (17.9)	
BMI, kg/m ² , mean (SD)	23.43 (3.19)	24.62 (2.64)	21.07 (2.86)	<.001
BMI categorized, kg/m ²				<.001
Thin (< 18.5)	10 (5.0)	0 (0.0)	10 (14.9)	
Normal (18.5-23.9)	110 (55.0)	63 (47.4)	47 (70.1)	
Overweight (24.0-26.9)	54 (27.0)	47 (35.3)	7 (10.4)	
Obesity (≥27)	26 (13.0)	23 (17.3)	3 (4.5)	
T-stage				.674
T1	79 (39.5)	51 (38.3)	28 (41.8)	
T2	43 (21.5)	31 (23.3)	12 (17.9)	
T3	41 (20.5)	25 (18.8)	16 (23.9)	
T4	37 (18.5)	26 (19.5)	11 (16.4)	
N-stage				.876
N0	166 (83.0)	110 (82.7)	56 (83.6)	
N+	34 (17.0)	23 (17.3)	11 (16.4)	
M-stage				.463
M0	191 (95.5)	126 (94.7)	65 (97.0)	
M1	9 (4.5)	7 (5.3)	2 (3.0)	
Grade				.536
Low grade	12 (6.0)	7 (5.3)	5 (7.5)	
High grade	188 (94.0)	126 (94.7)	62 (92.5)	
TPI, mm ² /m ² , mean (SD)	540.1 (74.2)	567.2 (64.1)	486.1 (62.9)	<.001
Hemoglobin (g/L), mean (SD)	121.5 (23.5)	124.3 (21.1)	115.8 (27.0)	.015
Albumin (g/L), mean (SD)	38.6 (15.3)	39.1 (15.7)	37.5 (14.6)	.488
Hospital time (days)	30.43 (9.78)	29.19 (9.71)	32.88 (9.53)	.011
Survival time (months)	30.67 (24.76)	31.20 (23.03)	29.61 (28.03)	.670
Mortality at 3 year				.044
No	139 (69.5)	100 (75.2)	39 (58.1)	
Yes	61 (30.5)	33 (24.8)	28 (41.8)	
Mortality at 5 year				.001
No	129 (64.5)	92 (69.2)	37 (55.2)	
Yes	71 (35.5)	41 (30.8)	30 (44.8)	

Abbreviations: BMI, body mass index; SD, standard deviation; TPI, total psoas index.

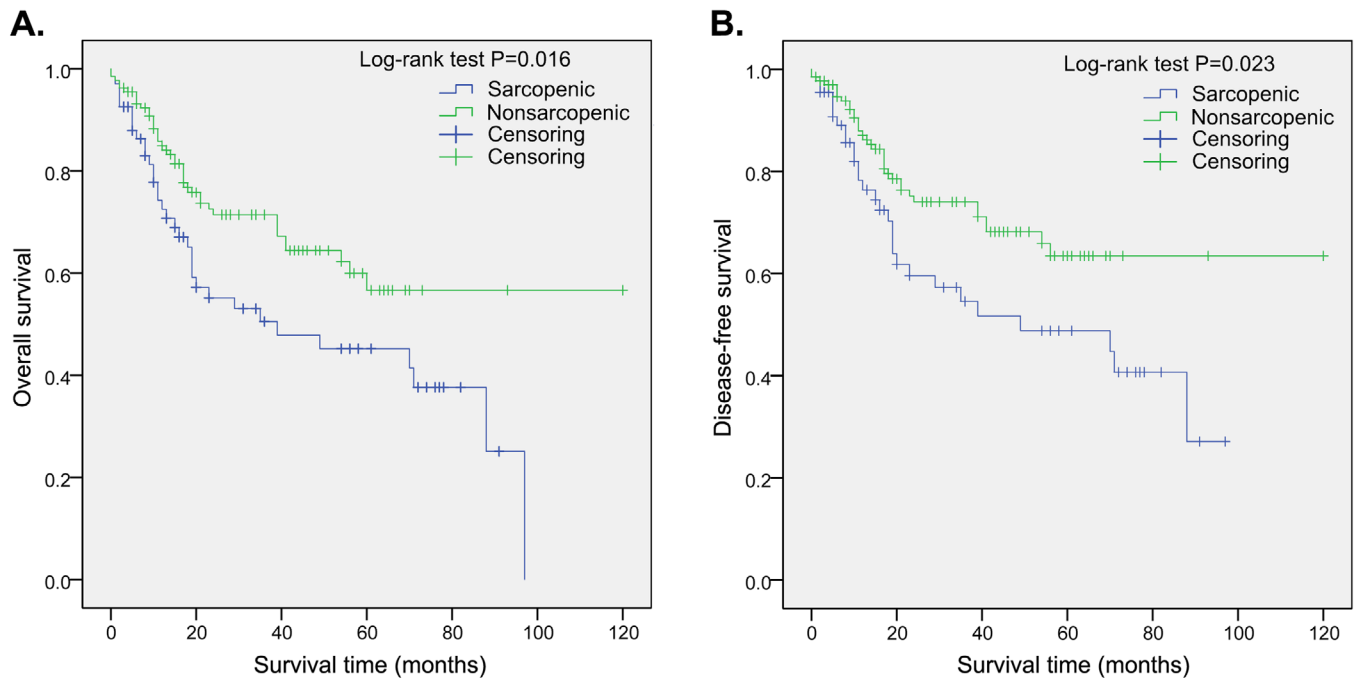


FIGURE 1 Kaplan-Meier curves of survival based on total psoas index (TPI) value of 200 patients with bladder cancer. **A**, Overall survival (OS). **B**, Disease-free survival (DFS)

CI, 0.29-0.75; $P = .002$) and DFS (HR = 0.44; 95% CI, 0.26-0.73; $P = .002$) compared with nonsarcopenic patients in multivariate cox analysis (Tables S1 and S2). In addition, based on the results of multivariate cox regression analysis, we constructed OS and DFS nomograms based on TNM stage and sarcopenic to predict the 3- and 5-year survival rates of undergoing RC patients (Figure S2). Moreover, decision curve analysis curves and receiver operating characteristic curves show better clinical utility of the nomogram (Figure S3).

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was in line with the Helsinki Declaration and approved by the Ethics Committee at the Tenth People's Hospital of Shanghai (SHSY-IEC-4.1/19-120/01). The study outcomes will not affect the future management of the patients. The use of human blood samples was in accordance with the legislation in China. Informed consent was obtained from the controls and patients or their relatives.

AVAILABILITY OF DATA AND MATERIALS

The dataset used during the study are available from the corresponding author on a reasonable request.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHOR CONTRIBUTIONS

WM, HZ, and MC designed the research. WM, JW, BX, and JG performed the research and analyzed the results. WM, BM, and KW wrote the paper. WM, HZ, and MC edited the manuscript and provided critical comments. All authors read and approved the final manuscript.

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SUPPORTING INFORMATION

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