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Impact of Sarcopenia on Erectile Function after Nerve-Sparing Robot-Assisted Radical Prostatectomy

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Purpose: To determine the impact of sarcopenia on erectile functional outcomes after a nerve-sparing (NS) robot-assisted radical prostatectomy (RARP) using patient-reported validated questionnaires.

Materials and Methods: In this retrospective study, RARP was performed on 841 patients at Okayama University Hospital, of which 132 underwent NS RARP. Erectile functional outcomes were assessed using the 5-item version of the International Index of Erectile Function (IIEF-5) and the Expanded Prostate Cancer Index Composite before and 1, 3, 6, and 12 months after surgery. Automated measurement of skeletal muscle at L3 was achieved using volume analyzer software and normalizing for height (cm^2/m^2) to calculate skeletal muscle index (SMI). Patients who had an IIEF-5≤4 comprised the group with erectile dysfunction (ED), and those with an IIEF-5≤5 made up the non-ED group.

Results: This study enrolled 95 patients of median age 65 years with a preoperative IIEF-5 of 16. There were no significant differences between patients with and without sarcopenia among those with preoperative IIEF-5. Postoperatively, in the ED group, SMI and preoperative IIEF-5 were significantly lower than in the non-ED group. Multiple linear regression analysis revealed that (1) both SMI and preoperative IIEF-5 were independent predictors of ED, and (2) sarcopenia and preoperative IIEF-5 were predictors of ED at 12 months after NS RARP.

Conclusions: Patients with sarcopenia can have worse erectile functional outcomes after NS RARP. Sarcopenia and a lower preoperative IIEF-5 score may be predictive of postoperative ED.

Keywords: Erectile dysfunction; Prostatectomy; Prostatic neoplasms; Quality of life; Sarcopenia

INTRODUCTION

Sarcopenia, or the abnormal loss of skeletal muscle (SM) mass and strength, is one of the most important causes of functional decline and involves hormonal, nutritional, immunological, and physical activity changes [1]. Sarcopenia is associated with poor postoperative outcomes including surgical complications, increased infection risk, a long hospital length of stays, and can contribute to overall mortality during several types of

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surgery [1-4]. Currently, the association between sarcopenia and surgical outcomes after radical prostatectomy (RP) is poorly understood.

Sexual dysfunction, especially erectile dysfunction (ED), is a common and established complication of RP [5]. Although the oncologic outcome is the most important goal of RP, sexual dysfunction after RP typically has a negative effect on health-related quality of life (HRQoL). Urologists aim to choose and offer the best treatment option to their patients whilst considering both cancer control and quality of life (QoL) after treatment.

Risk factors for sexual dysfunction after RP in patients with prostate cancer (PCa) have been reported for several studies [6-8]. Among them, patient age, preoperative erectile function, and nerve-sparing (NS) procedures are common factors influencing sexual function (SF) after prostatectomy [6-8]. However, sarcopenia has not been shown to be a risk factor for ED after RP.

Aging is one important factor that can lead to sarcopenia [9]. An ongoing increase in the number of elderly patients diagnosed with PCa poses a serious and emerging issue in cancer care with respect to QoL after RP. It can follow that better overall health care is vitally important to extending the survival of these types of patients. Sarcopenia has recently been investigated for its prognostic utility of treatment-related complications in cancer patients [1-4]. However, the impact of sarcopenia on SF after prostatectomy is unclear. We hypothesized that sarcopenia adversely affects erectile function recovery after RP. The aim of this study was to elucidate the effect of preoperative sarcopenia on sexual dysfunction after robot-assisted RP (RARP).

MATERIALS AND METHODS

1. Patients

We retrospectively identified 841 patients with PCa who had undergone RARP between October 2010 and May 2019 at Okayama University Hospital. Study inclusion criteria and patient selection are depicted in a flow diagram (Fig. 1). To remove the influence of surgical technique and experience, we selected only those cases performed by skillful surgeon with relatively same experience and finally 12 surgeons were included.

2. Methods

Computed tomography (CT) was performed using a 64-slice multi-detector scanner (Toshiba Medical Systems Corporation, Tochigi, Japan). Cross-sectional SM areas at the level of the third lumbar vertebra (L3) were measured automatically using the volume analyzer software Synapse Vincent version 4 (Fujifilm, Tokyo, Japan) [10] and threshold values of -29 to 150 Hounsfield units (HU) to distinguish muscle from other tissues. The SM area was normalized to height (cm^2/m^2) to calculate the SM index (SMI). Simultaneously, visceral adipose tissue (VAT) and subcutaneous abdominal fat tissue areas at L3 were measured automatically using threshold values of -200 to -50 HU. Sarcopenia was defined, as described by Martin et al [11], as an SMI <43 cm^2/m^2 for those with a body mass index (BMI) <25 kg/m^2 or a SMI<53 cm^2/m^2 for males with a BMI≥25 kg/m^2, and as an SMI<41 cm^2/m^2 for female patients. To evaluate HR QoL, the comprehensive 50-item Expanded Prostate Cancer Index Composite (EPIC) instrument was used [12,13]. This questionnaire encompasses four different domains (urinary, bowel, sexual, and hormonal functions) and is designed to evaluate a patient's

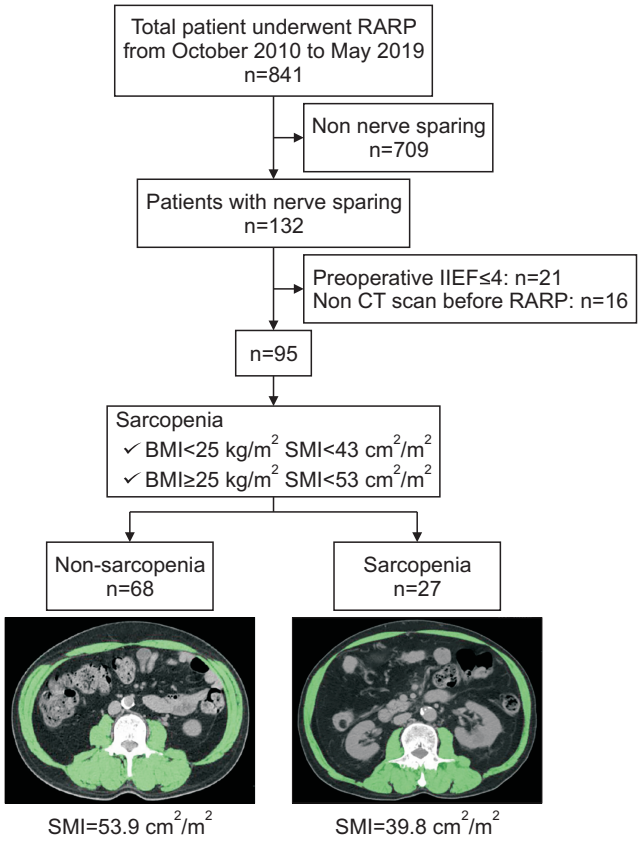

Fig. 1. Inclusion and exclusion criteria for this study. RARP: robot-assisted radical prostatectomy, IIEF: International Index of Erectile Function, CT: computed tomography, BMI: body mass index, SMI: skeletal muscle index.

functioning on a normalized scale ranging from 0 to 100, with higher scores representing better QoL. The sexual domain of the EPIC consists of two subscales comprising SF and sexual bother [14]. EPIC was used to assess function before and after treatment received for PCa. Longitudinal HRQoL surveys were conducted at baseline (within 3 months before RARP) and at 2 weeks and 1, 3, 6, and 12 months after RARP using EPIC. Erectile function was also assessed according to the 5-item version of the International Index of Erectile Function (IIEF-5) score. Patients who had a low IIEF-5 (≤4) were classified in the group with ED and those who had a relatively higher IIEF (≥5) were categorized in the group with non-ED. We chose a cutoff value of 5 because patients with a score less than 5 would be classified as having complete ED. In this study, we focused on sexual domain scores and their subscales after RARP.

3. Surgical approach

The surgeon first performed a pubic bone anchoring suture, followed by single-layer posterior reconstruction at the time of vesicourethral anastomosis. NS was undertaken in patients with PCa by intrafascial dissection using the veil technique [15]. Anterior or posterior approaches were used as follows. In the anterior approach, dissection of Retzius' space was started. The endopelvic fascia was incised laterally and carried distally to the apex of the prostate. The puboprostatic ligaments were incised. The bladder neck was incised between the bladder and prostate and the seminal vesicle and vas deferens were identified. In the posterior approach, the peritoneum in the pouch of Douglas was incised horizontally 2 cm above the rectum. The seminal vesicles and vas deferens were identified and the vas deferens were skeletonized, cauterized, and divided. The seminal vesicles were dissected free. Denonvilliers' fascia was incised in the midline and the rectum was dropped posteriorly off the prostate. Then, Retzius' space was dissected [16].

4. Statistical analyses

Patient characteristics and EPIC scores were statistically compared using the Wilcoxon test and Fisher's exact test, as deemed appropriate. The risk factors for ED at 12 months were analyzed using univariate and multivariate logistic regression analyses. Multivariate analysis included the variables determined to be significant in the univariate analysis. Statistical significance was set at $p<0.05$ for all analyses. All statistical analyses were performed using JMP 13.2 software (SAS Institute, Cary, NC, USA).

5. Ethics statement

All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments (2013) or comparable ethical standards. This clinical study was approved by the Okayama University Institutional Review Board prior to study initiation (IRB registration no. 1004 and no. 2004-037).

RESULTS

1. Patient characteristics

A total of 95 patients were included in this retrospective study. Baseline patient characteristics, surgical procedures, and outcomes are reported (Table 1). Overall, 27/95 patients (28.4%) were classified as sarcopenic. Although patients with sarcopenia have more hypertension (HT) and longer hospitalization stays than those without sarcopenia, there were no significant differences between patients with and without sarcopenia. A total of 14 patients were diagnosed with biochemical recurrence during follow-up. In 12 months, 7 patients were diagnosed with recurrence, 2 patients were treated with radiation therapy, 4 patients were treated with androgen blockage, and a patient chose active surveillance. Total 27 patients used phosphodiesterase-5 (PDE5) inhibitor after RARP (Supplement Table). All patients used PDE5 inhibitor on-demand.

2. Change in health-related quality of life after robot-assisted radical prostatectomy

Longitudinal changes in the EPIC sexual domain scores in the patients with and without sarcopenic are reported (Fig. 2). After RARP, the patients without sarcopenia had a better SF at 3 and 12 months compared with the patients who were sarcopenic. There were no significant differences in sexual bother scores between the two groups at any time point.

3. Change in 5-item version of the International Index of Erectile Function after treatment

The change in IIEF-5 from before RARP until 12

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Table 1. Patient characteristics

Characteristic	Total cases (n=95)	Non-sarcopenic (n=68)	Sarcopenic (n=27)	p-value
Age (y)	65 (59–68)	64.5 (58–68)	65 (60–69)	0.334
BMI (kg/m^2)	24.2 (22.6–25.9)	23.9 (22.9–25.7)	25.3 (21.9–26.2)	0.316
HT	28 (29.5)	16 (23.5)	12 (44.4)	0.051
DM	9 (9.5)	8 (11.8)	1 (3.7)	0.438
Prostate volume (mL)	24.7 (19.0–35.0)	25 (19.0–35.5)	24 (18.0–33.0)	0.812
Initial PSA (ng/mL)	7.5 (5.1–9.3)	7.2 (5.0–9.5)	8.0 (5.9–9.3)	0.287
Clinical T stage				0.177
<cT1c	32 (33.7)	22 (32.4)	10 (37.0)	
cT2a	45 (47.4)	33 (48.5)	12 (44.4)	
cT2b	5 (5.3)	5 (7.4)	0 (0.0)	
cT2c	11 (11.6)	7 (10.3)	4 (14.8)	
cT3 over	2 (2.1)	1 (1.5)	1 (3.7)	
ISUP grade group in prostate biopsy				0.254
Grade group 1	31 (32.6)	23 (33.8)	8 (29.6)	
Grade group 2	22 (23.2)	16 (23.5)	6 (22.2)	
Grade group 3	24 (25.3)	16 (23.5)	8 (29.6)	
Grade group 4	15 (15.8)	11 (16.2)	4 (14.8)	
Grade group 5	3 (3.2)	2 (2.9)	1 (3.7)	
CT measurement value				
VAT (cm^2)	131 (80–179)	119 (79–172)	165 (98–194)	0.067
SAT (cm^2)	92 (75–127)	91.7 (74–125)	97 (80–143)	0.345
VAT/SAT ratio	1.2 (1.0–1.7)	1.12 (0.9–1.6)	1.32 (1.0–1.8)	0.224
SM (cm^2)	139 (129–152)	143 (132–156)	128 (120–138)	<0.0001
SMI (cm^2/m^2)	49.7 (46.0–55.5)	53 (47.9–56.3)	45.8 (42.1–49.2)	<0.0001
Operation data				
Operation time (min)	211 (182–250)	208 (180–253)	219 (189–234)	0.426
EBL (mL)	100 (100–188)	125 (88–200)	100 (100–100)	0.475
Anterior approach	9 (9.5)	6 (8.8)	3 (11)	0.710
Nerve-sparing procedure				>0.999
Unilateral	76 (80.0)	54 (79.4)	22 (81.5)	
Bilateral	19 (20.0)	14 (20.6)	5 (18.5)	
Inpatient days	11 (10–13)	11 (10–13)	12 (10–13)	0.067
Preoperative IIEF-5	16 (12–20)	16 (12–20)	16 (12–21)	0.527
Lymph node dissection				0.709
Unilateral	25 (26.3)	19 (27.9)	6 (22.2)	
Bilateral	20 (21.0)	17 (25)	3 (11.1)	
Pathological T stage				0.265
T2a	13 (13.7)	10 (14.7)	3 (11.1)	
T2b	6 (6.3)	4 (5.9)	2 (7.4)	
T2c	62 (65.3)	44 (64.7)	18 (66.7)	
>T3a	14 (14.7)	10 (14.7)	4 (14.8)	

months after is shown in a waterfall plot (Fig. 3). This figure shows that patients with sarcopenia had a worse recovery in terms of erectile function.

4. Association between sarcopenia and erectile dysfunction 12 months after robot-assisted radical prostatectomy

Table 2 shows the associations between sarcopenia and ED after surgery. Univariate analysis identified additional treatment, SMI and preoperative IIEF-

Table 1. Continued

Characteristic	Total cases (n=95)	Non-sarcopenic (n=68)	Sarcopenic (n=27)	p-value
ISUP grade group				0.263
Grade group 1	15 (15.8)	13 (19.1)	2 (7.4)	
Grade group 2	41 (43.2)	26 (38.2)	15 (55.6)	
Grade group 3	21 (22.1)	17 (25)	4 (14.8)	
Grade group 4	6 (6.3)	4 (5.9)	2 (7.4)	
Grade group 5	12 (12.6)	8 (11.8)	4 (14.8)	
Recurrence during post 12 months	7 (7.4)	6 (8.8)	1 (3.7)	0.669
Time for recurrence months	8.1 (5.4–9.1)	8.3 (6.9–9.4)	2.2	
Additional treatment	6 (6.3)	5 (7.4)	1 (3.7)	0.671

Values are presented as median (interquartile range) or number (%).
BMI: body mass index, HT: hypertension, DM: diabetes mellitus, PSA: prostate-specific antigen, ISUP: International Society of Urological Pathology, CT: computed tomography, VAT: visceral adipose tissue, SAT: subcutaneous adipose tissue, SM: skeletal muscle, SMI: skeletal muscle index, EBL: estimated blood loss, IIEF-5: 5-item version of the International Index of Erectile Function.

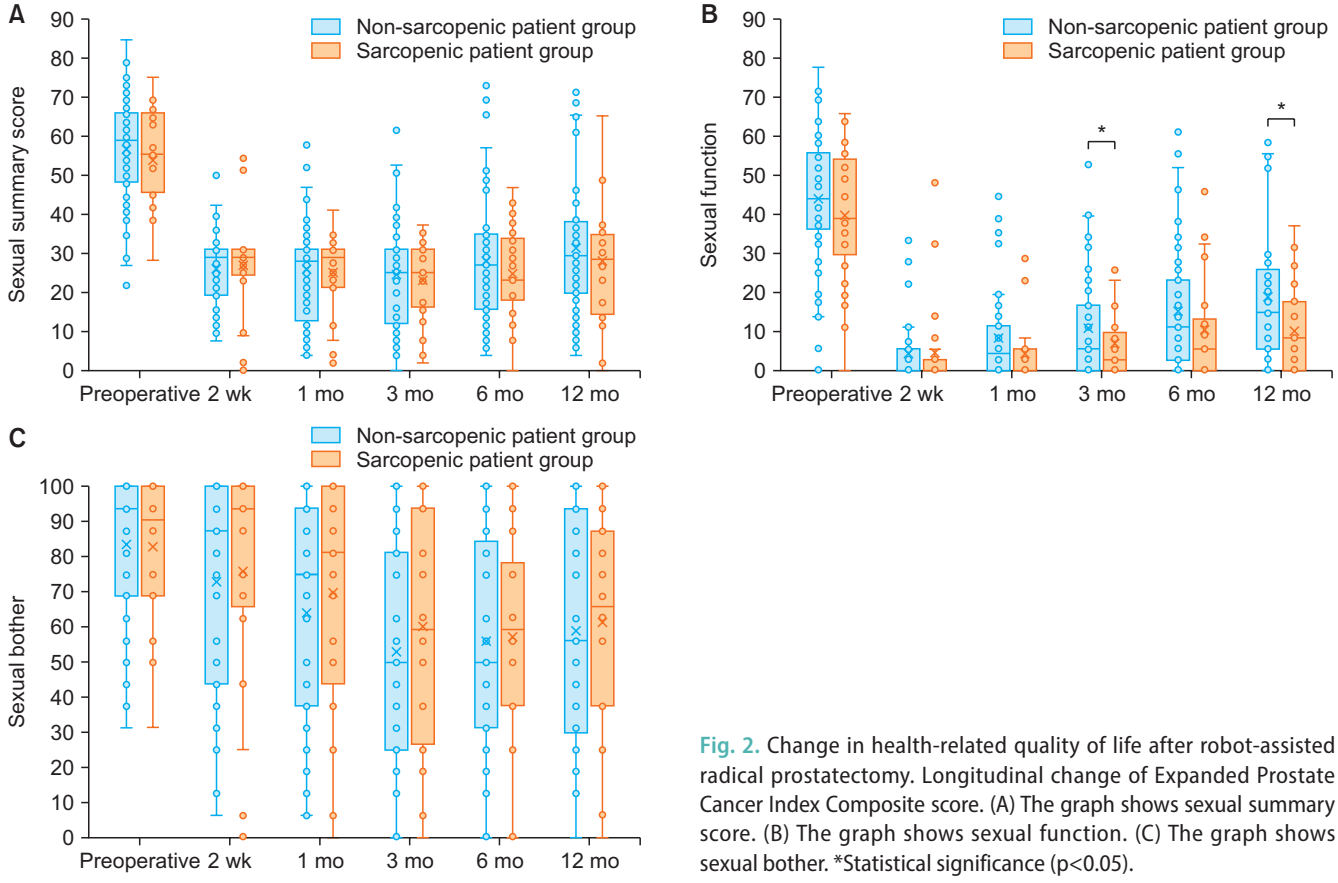

Fig. 2. Change in health-related quality of life after robot-assisted radical prostatectomy. Longitudinal change of Expanded Prostate Cancer Index Composite score. (A) The graph shows sexual summary score. (B) The graph shows sexual function. (C) The graph shows sexual bother. *Statistical significance (p<0.05).

5 as predictors of ED after surgery (p=0.035, p=0.004, and p=0.006, respectively). Multivariate analysis also revealed that SMI and preoperative IIEF-5 were independent predictors of postoperative ED (odds ratio [OR]=3.91, p=0.1842, OR=1.13, p=0.0015, and OR=1.15, p=0.0016, respectively).

5. Factors associated with erectile dysfunction at 12 months

To assess the associations between ED at 12 months and other various factors, univariate and multivariate analyses were performed. Univariate analyses identified the following two factors as significantly associated with a low IIEF-5 at 12 months after RARP: pre-

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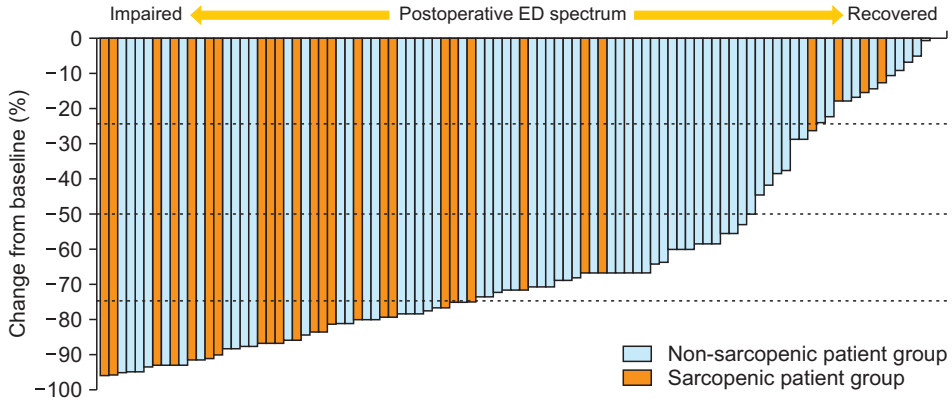

Fig. 3. Change in 5-item version of the International Index of Erectile Function (IIEF-5) after robot-assisted radical prostatectomy (RARP). This water plot shows that change in IIEF-5 from baseline until 12 months after RARP. Total 19 sarcopenic patients (70.3%) worse postoperative IIEF-5 over 75% while sarcopenic patients were 23 patients (33.8%).

Table 2. Associations with erectile dysfunction (ED) at 12 months after robot-assisted radical prostatectomy

Variable	Non-ED (n=51)	ED (n=44)	p-value	Multivariate analysis		
				OR	95% CI	p-value
Age (y)	64.5 (57–69)	65 (61–68)	0.423			
BMI (kg/m^2)	24.6 (22.9–26.0)	23.9 (22.0–25.6)	0.275			
PV (mL)	24.0 (18.7–32.0)	25.0 (19.0–37.0)	0.704			
PSA (ng/mL)	7.0 (5.1–9.4)	7.5 (5.5–9.2)	0.560			
Bilateral-NS	13	6	0.198			
Posterior approach	7	2	0.170			
Additional treatment	1	6	0.035	3.91	0.41–36.9	0.1842
VAT (cm^2)	128 (80–187)	134 (83–172)	0.946			
SAT (cm^2)	97 (80–127)	91 (71–127)	0.560			
VAT/SAT ratio	1.1 (1.0–1.7)	1.3 (0.9–1.7)	0.762			
SM (cm^2)	144 (133–154)	135 (124–150)	0.028			
SMI (cm^2/m^2)	52.4 (48.2–56.4)	48.0 (44.2–52.8)	0.004	1.13	1.05–1.23	0.0015
Preoperative IIEF-5	17 (15–22)	15 (10–19)	0.006	1.15	1.05–1.26	0.0016
Use PDE5 inhibitor	17	10	0.362			
Regularly prescription of PDE5 inhibitor	9	4	0.251			

Values are presented as median (range) or number (%).
OR: odds ratio, CI: confidence interval, BMI: body mass index, PV: prostate volume, PSA: prostate-specific antigen, NS: nerve-sparing, VAT: visceral adipose tissue, SAT: subcutaneous adipose tissue, SM: skeletal muscle, SMI: skeletal muscle index, IIEF-5: 5-item version of the International Index of Erectile Function, PDE5: phosphodiesterase-5.

operative IIEF-5 (>16 *vs.* ≤16; OR=2.55, 95% confidence interval [CI]: 1.11–5.87, p=0.028) and sarcopenia (yes *vs.* no; OR=3.23, 95% CI: 1.27–8.25, p=0.014) (Table 3). These two factors were included in a multivariate analysis, which identified preoperative IIEF-5 and sarcopenia as significant independent predictors of ED after RARP (OR=2.83, 95% CI: 1.18–6.82, p=0.0202 and OR=3.559, 95% CI: 1.35–9.56, p=0.0105, respectively).

DISCUSSION

This study identified the presence of preoperative sarcopenia as a novel factor affecting ED recovery and which lowers sexual QoL after RARP. In previous studies, patients' age and preoperative IIEF-5 have been reported as factors associated with ED after RP [6,7]. Our study also established that preoperative IIEF-5 was strongly associated with postoperative SF; however, the age of patients had no relationship with postoperative ED. Although a report has revealed an association between sarcopenia and ED in patients with type 2 diabetes mellitus (DM), no reports link sarcopenia and ED in patients who undergo RARP [17]. It is the authors' understanding, that the study described herein is the first report to demonstrate a relationship between sarcopenia and sexual QoL after RARP.

Table 3. Associations with sexual dysfunction at 12 months after robot-assisted radical prostatectomy

Variable	ED at 12 months after robot-assisted radical prostatectomy					
	Univariate analysis			Multivariate analysis		
	OR	95% CI	p-value	OR	95% CI	p-value
Age	0.96	0.90–1.03	0.239			
BMI≥25 kg/cm^2	0.75	0.33–1.72	0.502			
HT (yes)	1.01	0.42–2.44	0.989			
DM (yes)	0.92	0.23–3.66	0.906			
PV	1.00	0.96–1.03	0.924			
PSA	1.04	0.96–1.12	0.334			
Bilateral-NS (no)	2.17	0.75–6.30	0.155			
Additional treatment (yes)	7.54	0.87-65.3	0.067			
Preoperative IIEF-5≤16	2.55	1.11–5.87	0.028	2.83	1.18–6.82	0.0202
VAT/SAT ratio≥1.2	1.44	0.64–3.25	0.375			
Sarcopenia (yes)	3.23	1.27–8.25	0.014	3.56	1.35–9.56	0.0105
Use PDE5 inhibitor (yes)	0.58	0.24–1.47	0.251			

ED: erectile dysfunction, OR: odds ratio, CI: confidence interval, BMI: body mass index, HT: hypertension, DM: diabetes mellitus, PV: prostate volume, PSA: prostate-specific antigen, NS: nerve-sparing, IIEF-5: 5-item version of the International Index of Erectile Function, VAT: visceral adipose tissue, SAT: subcutaneous adipose tissue, PDE5: phosphodiesterase-5.

Erectile function is dependent on a complex interaction of vascular and neural processes, particularly with respect to increasing blood flow into the corpora cavernosa [14]. Therefore, ED can result from any process that impairs the vascular pathways that contribute to erection [14]. A recent study showed that men with peripheral arterial disease demonstrated a high prevalence of sarcopenia and decreased functional mobility [18]. Sarcopenia can affect postoperative ED. Our findings suggest that an evaluation of sarcopenia before treatment is useful for predicting postoperative ED. ED is defined as the consistent or recurrent inability to attain and/or maintain penile erection sufficient for sexual satisfaction according to the Fourth International Consultation on Sexual Medicine [19]. As we have described previously, aging is an independent risk factor for the development of ED, and many men assume that sexual impairment is an inevitable consequence of aging [14,20]. Risk factors for developing ED include tobacco use, obesity, sedentary lifestyle, and chronic alcohol use. These risk factors would cause hormonal changes that result in low testosterone and impaired endothelial function, which can contribute to the development of ED [14,20]. In contrast, a previous study reported no relationship between metabolic syndrome and ED in healthy men [20]. However, patients who have previously been diagnosed with DM, HT, dyslipidemia, or depression have a higher than normal risk of developing ED [14,20]. Among men diagnosed with ED, approximately 40% have HT, 42% have hyperlipidemia, and 20% have DM [21,22]. ED after RP is recognized as one of the major postoperative complications that considerably impacts the QoL of patients. According to previous reports, initiating a penile rehabilitation program as promptly as possible postsurgery is a better option than inaction, in order to limit or prevent local hypoxygenation and fibrosis [5]. The effectiveness of PDE5 inhibitor therapy on postoperative ED has made it the standard of care treatment for penile rehabilitation [5,23]. In this study, we prescribed PDE5 inhibitors, including sildenafil, vardenafil, and tadalafil, in accordance with each patient's preference. No correlation was observed between postoperative ED recovery and PDE5 inhibitor use. Moreover, aging, obesity, HT, and DM were not identified as independent risk factors for postoperative ED. Thus, the cause of postoperative ED was considered to be affected by other factors. Our study revealed that sarcopenia is a novel predictor of postoperative ED.

The incidence of sarcopenia is 20% in healthy people less than 70 years of age, and more than 50% after 80 years of age [24]. In our study, 28.4% of patients were defined as sarcopenic and this result is highly similar to previous reports. As people live longer, the number of patients with sarcopenia will increase [9]. Aging tends to increase the likelihood of SM loss, fat accu-

mulation, HT, and DM. Previous studies report that obesity and arteriosclerosis, as well as HT and DM, can contribute to the root cause of ED [20,25]. However, the association between sarcopenia and ED after prostatectomy was unknown. In this study, patients with sarcopenia had a higher rate of HT and a greater VAT area in L3 than in the patients without sarcopenia. These factors were not associated with postoperative ED in our multivariate analysis. Instead, we identified preoperative IIEF-5 and sarcopenia as risk factors predictive for ED after prostatectomy. Recently, we investigated the correlation between sarcopenia and urinary incontinence (UIN), and uncovered new evidence showing that the presence of sarcopenia is one factor predictive of UIN after RARP [26]. Thus, the potential for preoperative sarcopenia to be associated with postoperative QoL after RARP is substantial.

It is clinically beneficial to evaluate sarcopenia. At our institution, almost all patients who are diagnosed with PCa undergo CT to screen for potential metastasis. Sarcopenia was diagnosed using CT to measure SM area. Our patients incurred no associated costs, no radiation, and the time burden was negligible. The strength of this diagnostic method is based on the use of automated software that greatly minimizes measurement bias and generates reproducible measurements of SM area, even among multiple observers [10]. Given the long-term survival expectancy of patients with localized PCa, the treatment for PCa should be chosen based on both the oncologic outcome and postoperative QoL. Brachytherapy was shown to be superior to bilateral NS RARP for maintaining, sexual QoL, and treating UIN in one study [27]. Young men in particular, who are eligible for active surveillance, are advised to choose the optimal treatment that takes into consideration postoperative QoL [6]. We identified sarcopenia as a predictor of lower sexual QoL after RARP. Use of a combination of factors, including sarcopenia status, will likely increase the efficacy of predicting ED. These suggest that knowing that before surgery would only help inform treatment decisions – *i.e.*, avoid surgery for low risk disease or just help informed decision making about the decision to forego NS and help patients mentally prepare for post op ED.

This study has some limitations. First, it was a retrospective study performed at a single institution, and the number of patients assessed was relatively low. It is possible that small sample size studies can result in lack of statistical significance due to the relationship between sarcopenia and erectile function. To more conclusively investigate the prognostic role of sarcopenia in QoL, studies involving larger cohorts are necessary. Second, it was well known that testosterone and PCa have a positive association [28,29]. And testosterone would correlate with erectile function [30]. However, we have no data of serum testosterone level. Third, we evaluated sarcopenia using CT scan. To define sarcopenia more clearly, other evaluating methods were needed: hand grip test or walking speed measurement.

Finally, we prescribed PDE5 inhibitors in accordance with the preference of each patient. Some patient continued to use PDE5 inhibitors, whereas others stopped using them because of ineffectiveness. Despite these limitations, this study demonstrated for the first time that preoperative sarcopenia, as measured by CT, is a novel predictor of ED after RARP.

CONCLUSIONS

After RARP, patients with sarcopenia had a lower sexual QoL compared with patients without sarcopenia at 12 months. Sarcopenia was identified as an independent prognostic factor for postoperative ED recovery. The results of this study contribute to informing urologist regarding treatment options for patients with PCa, although further research is warranted to further clarify the effect of sarcopenia on postoperative SF.

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Conflict of Interest

The authors have nothing to disclose.

Author Contributions

Conceptualization: YM, AGHR, TS. Data curation: YM, YM. Formal analysis: YM, RS. Supervision: KW, MA, MW, TW, YN. Writing – original draft: YM. Writing – review & editing draft: all authors.

Supplementary Material

Supplementary material can be found *via* https://doi.org/10.5534/wjmh.200036.

Data Sharing Statement

The data required to reproduce these findings cannot be shared at this time due to legal and ethical reasons.

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