Original Article

Clinical usefulness of psoas muscle thickness for the prognosis of acute type A aortic dissection patients undergoing total arch replacement

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Background: Sarcopenia has emerged as a comprehensive predictor of mortality in diseased populations. The aim of this study was to evaluate the prognostic and predictive value of psoas muscle thickness/height (PMTH) measurement in patients with acute type A aortic dissection (AAAD).

Methods: A retrospective analysis of patients (from January 2020 to December 2020) who underwent AAAD surgery at our institution was conducted. PMTH, as a measure of sarcopenia, was measured by preoperative computed tomography. Patients were classified into two groups according to the cut-off value of PMTH. To balance potential bias, a 1:1 propensity score matching (PSM) with a caliper 0.05 was conducted.

Results: PSM analysis created 68 pairs of patients. In short-term outcomes, a lower PMTH value was strongly correlated with higher in-hospital mortality and renal failure. Receiver operating characteristic (ROC) analysis suggested that sarcopenia had good predictive capabilities in in-hospital mortality, with the area under curve (AUC) of 0.81 [95% confidence interval (CI): 0.64–0.97]. During a median follow-up of 37 months, 24 (19.4%) patients died, including 16 in low PMTH group and 8 in high PMTH group. Kaplan-Meier analysis indicated the sarcopenia significantly affected long-term survival [log-rank P=0.02; hazard ratio (HR) 2.53 (95% CI: 1.13–5.66)]. Multivariable Cox regression analysis revealed that sarcopenia was an independent predictor for decreased survival [HR 2.73 (95% CI: 1.15–8.78)].

Conclusions: Sarcopenia defined from the PMTH may be a useful tool for predicting short- and long-term mortality in patients after AAAD surgery.

Keywords: Sarcopenia; acute type A aortic dissection (AAAD); prognosis; psoas muscle thickness

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Introduction

Sarcopenia is characterized by the decline of skeletal muscle mass, muscle strength, and physical activity (1). It has been suggested to be associated not only with aging process (2), but also an impaired physical capability (3,4). Moreover, the relationship between sarcopenia and mortality, comorbidities of patients with cardiac surgery, is reported by several studies (5-7). Noteworthy, there is still no consensus measurement on quantifying and diagnosing sarcopenia. The skeletal muscle index (SMI), defined as the cross-sectional area of several muscles on computed tomography (CT) at the L3 vertebral level, is one of the most commonly used assessment in research area (8). However, the delineation of different groups of muscles surfaces is relatively complex, takes time, and requires specific software, restricting its clinical applicability. Durand *et al.* tried to used psoas muscle thickness/height (PMTH) measured on CT to diagnose sarcopenia and was determined to be associated with mortality in patients with cirrhosis (9). The diameter of the psoas muscle perpendicular to the longest axial diameter of the muscle at the umbilical level could be measured directly and the value was normalized by body height. All the acute type A aortic dissection (AAAD) patients underwent thoraco-abdominal aorta computed tomography angiography (CTA) scans before operation to assess the aorta. In this study, we aimed to assess whether preoperative computed tomography-measured psoas muscle thickness per height can be used to predict the prognosis after emergency surgery in AAAD patients. We present this article in accordance with the STROBE reporting checklist (available at https://jtd.amegroups.com/article/view/10.21037/jtd-24-196/rc).

Highlight box

Key findings

- Sarcopenia defined from the psoas muscle thickness/height (PMTH) may be a useful tool for predicting short- and long-term mortality in patients after acute type A aortic dissection (AAAD) surgery.

What is known and what is new?

- Sarcopenia, a loss of muscle mass commonly seen in the elderly, is related to the prognosis of many diseases.
- After controlling for factors such as gender and age, sarcopenia remains associated with both early and late prognosis in patients with AAAD.

What is the implication, and what should change now?

- Sarcopenia defined from PMTH can indeed be incorporated into preoperative assessment protocols to identify high-risk patients.

Methods

Study participants and study design

This was a retrospective, single-center observational study with a sample of patients with emergency surgery for AAAD selected from Fujian Medical University Union Hospital between January 2020 and December 2020. All the patients underwent thoracic and abdominal CTA before aortic repair operation. Individuals of missing data on the key variables were excluded. For this retrospective study, the requirement for informed consent was waived by the ethics committee of Fujian Medical University Union Hospital because patient data were anonymized. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). This study was approved by the Medical Ethics Committee of Fujian Medical University Union Hospital (No. 2021KY0127).

We divided the included patients into two groups according to PMTH cut off value. Subsequently, baseline characteristics, in-hospital outcomes, and long-term survival were compared among the patients. Patients were followed up until June 2023. Follow-up data were obtained via outpatient clinic visits or by telephone.

Measurement of PMTH

The PMT was determined using abdominal CT that was performed before the operation using a 64-slice multidetector CT scanner (Discovery CT750 HD; GE Healthcare, Waukesha, WI, USA), yielding 0.6-mm-thick slices, in accordance with what was done in previous studies (9-12) (*Figure 1*). A cross-sectional CT image at the level of L3 was selected, and the maximum transverse thickness of the right psoas muscle was measured using STARTPACS (Start Group Co., Ltd., Fuzhou, China). PMT was standardized by height to control for differences: PMTH (mm/m) =PMT (mm)/height (m). The cut-off point of PMTH was set at 16.8 mm/m, according to existing literature (11).

Statistical analysis

SPSS version 27.0 (IBM Corp., Armonk, NY, USA) was used for all statistical analyses. Data were presented as mean ± standard deviation, median (interquartile range), or number

(%). The unpaired student's *t*-test or Mann-Whitney test was performed to compare the continuous variables between groups, and the Chi-squared test or Fisher test was used for categorical variables. Patients were classified into two groups based on PMTH cut off value. Propensity score matching (PSM) was calculated based on a logistic regression model, with a caliper 0.05, matching ratio =1:1 to balance potential bias. The mirror histogram of propensity scores is listed to show the matching details (13). Long-term survival was estimated via the Kaplan-Meier method, and comparisons between the two groups were performed with the log-rank test. To find out independent risk factors, variables with P<0.20 on univariate analysis were entered into Cox proportional hazards regression analysis. And the heterogeneous effect of PMTH on long-term survival was assessed by creating interaction terms between PMTH and age. Statistical significance was set at P<0.05.

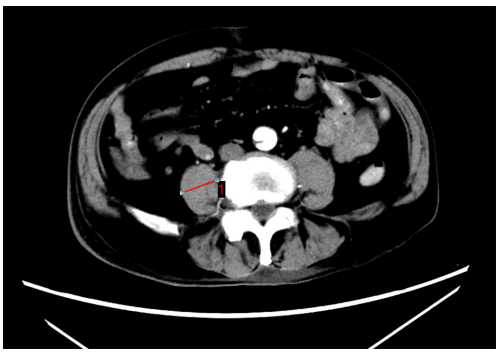

Figure 1 Measurement of psoas muscle thickness on preoperative computed tomography. The red line represents the measured thickness of the psoas muscle at the level of the third lumbar vertebra (L3).

Results

Patient selection and baseline characteristics

The patient selection chart and PSM details are shown in *Figure 2*. After grouping by the cut-off point of PMTH, analyses revealed statistical differences in age, gender, body mass index (BMI), hemoglobin and albumin. Not surprisingly, psoas muscle mass decreased with increasing age and the worse trophic status. To solve this issue, a 1:1 PSM was conducted to reduce the potential bias. Finally, 68 pairs were successfully matched. The baseline characteristics before and after PSM in each group are summarized in *Table 1*.

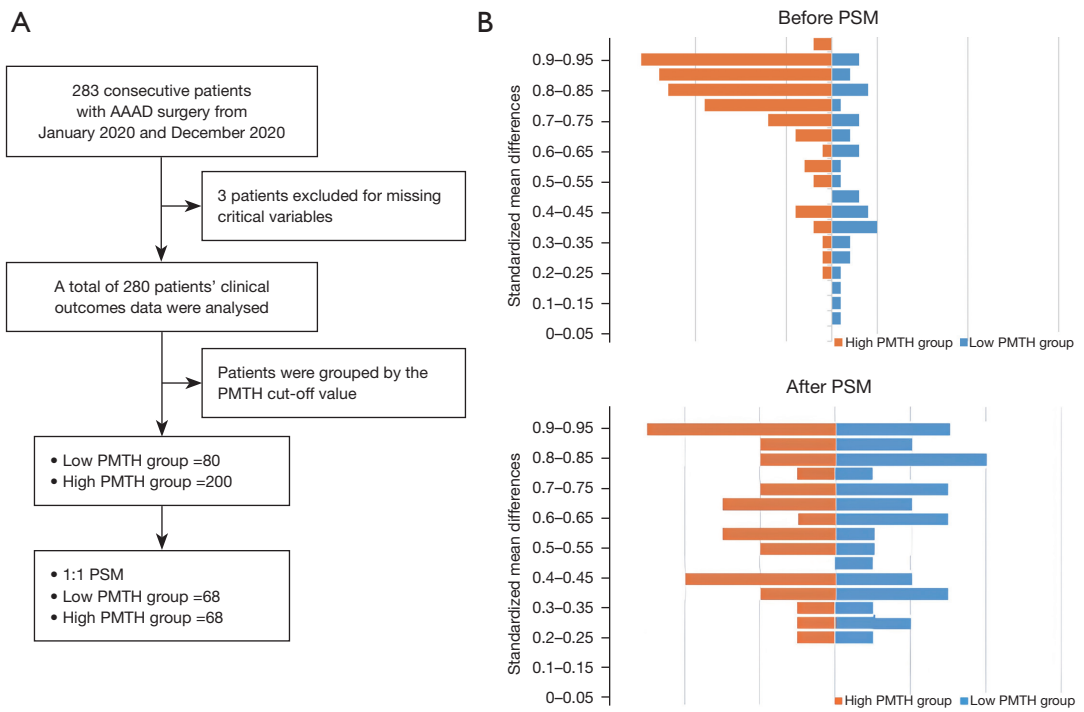

Figure 2 The study design. (A) Patient selection flowchart; (B) mirror histogram of propensity scores for patients. AAAD, acute type A aortic dissection; PMTH, psoas muscle thickness/height; PSM, propensity score matching.

Table 1 Baseline characteristic before and after propensity score matching

Parameters	Before PSM			After PSM		
	Low PMTH (n=80)	High PMTH (n=200)	P	Low PMTH (n=68)	High PMTH (n=68)	P
Age (years)	56 [44, 66]	53 [44, 63]	0.04	54 [44, 64]	53 [43, 62]	0.42
Male	44 (55.0)	174 (87.0)	<0.001	44	42	0.72
BMI (kg/m^2)	23.62 (21.52, 25.41)	24.63 (21.99, 26.57)	0.046	24.30 (21.90, 25.98)	23.95 (20.75, 27.00)	0.63
Hypertension	58 (72.5)	132 (66.0)	0.29	46	40	0.29
Diabetes	6 (7.5)	6 (3.0)	0.09	4	2	0.40
Coronary artery disease	0	4 (2.0)	0.20	0	2	0.15
Marfan syndrome	2 (2.5)	4 (2.0)	0.79	2	2	1.000
Previous CVA	6 (7.5)	12 (6.0)	0.61	6	4	0.51
LVEF (%)	62.45 (60.03, 66.90)	63.27 (60.35, 66.95)	0.45	62.04 (59.63, 67.80)	62.68 (60.18, 66.13)	0.65
Aortic valve regurgitation	22 (27.5)	54 (27.0)	0.93	16	14	0.68
Pericardial effusion	14 (17.5)	14 (7.0)	0.06	10	12	0.64
Preoperative malperfusion	16 (20)	18 (9.0)	0.07	10	4	0.09
Leucocytes (10^9/L)	12.12 (11.46, 12.78)	12.75 (12.34, 13.16)	0.19	12.10 (11.40, 12.85)	12.56 (12.20, 13.08)	0.47
Hemoglobin (g/L)	127.07 (123.71, 130.42)	132.80 (130.96, 134.63)	0.02	128.28 (123.61, 131.75)	130.74 (129.75, 133.55)	0.26
TBIL (U/L)	17.33±9.20	18.25±10.33	0.49	17.52±9.50	18.07±10.25	0.75
Albumin (g/L)	37.25±4.11	39.12±4.32	0.001	37.95±3.62	38.52±4.02	0.39
Urea (mmol/L)	8.08±3.70	7.93±2.07	0.67	8.01±4.43	7.96±2.87	0.94
Creatinine (μmol/L)	90.59±75.76	93.33±50.76	0.73	90.55±76.50	92.38±53.25	0.87
Aortic root procedure			0.33			0.27
No treatment	28 (35.0)	86 (43.0)		26	30	
Sinus plasty	38 (47.5)	68 (34.0)		30	18	
Bentall procedure	14 (17.5)	46 (23.0)		12	20	
CPB time (min)	150.13 (123.75, 167.50)	145.86 (125.00, 159.75)	0.41	145.63 (117.75, 146.25)	139.70 (118.50, 157.00)	0.32
ACC time (min)	74.15 (49.25, 85.75)	70.55 (53.00, 81.00)	0.45	72.83 (49.50, 82.00)	64.50 (52.50, 71.50)	0.19
SACP time (min)	9.75 (7.00, 11.75)	10.13 (7.00, 13.00)	0.42	9.83 (7.75, 13.00)	9.20 (6.00, 12.25)	0.31

Data are presented as mean ± standard deviation, median (interquartile range) or number (%). PMTH, psoas muscle thickness/height; PSM, propensity score matching; BMI, body mass index; CVA, cerebrovascular accident; LVEF, left ventricular ejection fraction; TBIL, total bilirubin; CPB, cardiopulmonary bypass; ACC, aortic cross-clamp; SACP, selective antegrade cerebral perfusion.

After PSM, the clinical and demographic characteristics were well-balanced between the two groups, including age, gender, BMI, preoperative comorbidities, laboratory indicators, echocardiography data, aortic root procedure, operative times.

Clinical outcomes

In the entire cohort, in-hospital death occurred in 16 patients (13 in low PMTH group and 3 in high group) and the

Table 2 Short-term outcomes after propensity score matching

Events	Low PMTH	High PMTH	P
In-hospital mortality	10	2	0.02
Ventricular fibrillation	2	0	0.15
Low cardiac output syndrome (need IABP)	3	0	0.08
Secondary thoracotomy	2	0	0.15
Myocardial ischemia	2	2	>0.99
Renal failure (need CRRT)	18	4	0.001
Respiratory failure	8	4	0.23
Hepatic insufficiency	4	1	0.17
Gastrointestinal bleeding	3	1	0.31
Permanent neurological deficits	3	1	0.31
Sepsis	6	4	0.51
Secondary intubation	3	0	0.08
Tracheotomy	1	0	0.32
Pericardial effusion (massive)	6	5	0.75

Short-term outcomes, is defined as grade III or above complications of individual systems according to The International Aortic Arch Surgery Study Group (IAASSG) myocardial ischemia, requiring diagnostic angiography with or without percutaneous coronary intervention. Respiratory failure, atelectasis, pneumonia, pulmonary edema, or acute lung injury, requiring noninvasive ventilation, or requiring intubation for 3 to 7 d. Hepatic insufficiency, hepatobiliary ischemia manifested as metabolic acidosis or increased lactate or prothrombin time, requiring general surgeon consultation. Gastrointestinal bleeding, bleeding, requiring ≥4 U packed red blood cell; bleeding, requiring ≥2 rounds of blood products (fresh frozen plasma, cryoprecipitate, or platelets); or massive transfusion protocol activated. PMTH, psoas muscle thickness/height; IABP, intra-aortic balloon pump; CRRT, continuous renal replacement therapy.

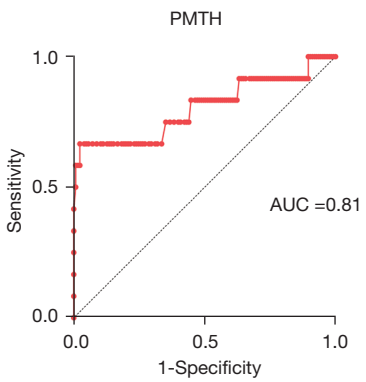

Figure 3 ROC curve for evaluating PMTH predicting performance. The AUC was 0.81 and indicate a good discrimination and differentiation. PMTH, psoas muscle thickness/height; AUC, the area under curve; ROC, receiver operating characteristic curve.

mortality rate was 5.7% for all patients. After PSM, the number of deaths in the two groups was 10 and 2 (P=0.02) (*Table 2*). Patients with the low PMTH values had a generally poor short-term outcomes, which had a markedly higher odds for in-hospital mortality (P=0.02) and renal failure (P=0.001) (*Figure 3*). Receiver operating characteristic (ROC) analysis was performed to verify whether PMTH could predict in-hospital mortality. The area under ROC curve (AUC) was 0.81 (95% CI: 0.64–0.97), which reflects a good predictive performance of the PMTH. The cut-offs for in-hospital mortality were PMTH at 15.68 mm/m (sensitivity: 97.6%, specificity: 66.7%).

Among the 124 survivors, late death occurred in 24 patients (19.4%) [cardiovascular and cerebrovascular events, n=15 (62.5%); infection, n=5 (20.8%); cancer, n=2

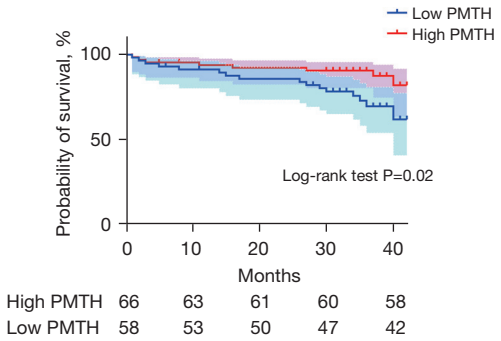

Figure 4 Kaplan-Meier curves of overall survival with 95% confidence intervals. PMTH, psoas muscle thickness/height.

(8.3%); and others, n=2 (8.3%)]. Kaplan-Meier survival estimates according to PMTH for AAAD patients is shown in *Figure 4*. The cumulative survival rates in low PMTH group and high PMTH group patients were 61.9%±9.5% and 82.0%±6.9%, respectively [log-rank P=0.02; HR 2.53 (95% CI: 1.13–5.66)]. The mean follow-up period was 37 months, and the follow-up rate was 100%.

Predictors of long-term survival

To assess the impact of sarcopenia on the long-term survival, Cox proportional hazards model was performed. On univariate analysis, the PMTH value was significantly associated with higher mortality [HR 2.86 (95% CI: 1.12–8.99)], and remained as an independent predictor of survival after adjusting for multivariable analysis [HR 2.73 (95% CI: 1.15–8.78)]. Other predictors identified included age [HR 1.03 (95% CI: 1.01–1.05)], preoperative malperfusion [HR 2.35 (95% CI: 1.57–9.22)], cardiopulmonary bypass (CPB) time [HR 1.01 (95% CI: 1.00–1.02)] (*Table 3*). Subgroup analysis was conducted to determine the association between PMTH and age, as well as its impact on prognosis outcomes (*Table 4*). There was no significant difference in the relationship between PMTH and long-term survival among age (interaction P=0.59).

Discussion

The principal finding of this study was that preoperative sarcopenia was independently associated with the greater risk of mortality in patients after AAAD surgery. Computed tomography-measured psoas muscle thickness is a simple, objective, and readily available method to assess skeletal muscle mass. In comparison with other methods for identifying the sarcopenia, e.g., questionnaires and the assessment of certain physical activities (14), PMTH is convenience in actual clinical practice. Considering the fact that the PMTH value has been reported to be tightly correlated with sex and BMI (15,16), the propensity-matched analysis was adopted to make the baseline characteristics comparably.

AAAD is a lethal disease with poor prognosis. The in-hospital mortality is reportedly 9.4–22% (17,18). Technological advances in cardiac surgery have led to personalized treatment options for each condition. As such, preoperative and fast identification of patients at high risk for mortality and morbidity has become more essential to provide optimal treatment to each patient. The occurrence of aortic dissection is associated with connective tissue abnormalities of the arterial wall influenced by enzymatic activity (19). Matrix metalloproteinases, which are implicated in this process, have also been shown to affect muscle development (20). It is commonly accepted that muscle wasting may be explained by the malnourished state of negative protein balance, characterized by the chronic loss of body protein and fuel reserves (21). There have been previous studies on the relationship between the sarcopenia and the prognosis of patients with chronic wasting diseases, like cirrhosis, end-stage kidney disease and valvular heart disease (15,22,23). However, less is known about the impact of sarcopenia on the outcomes of AAAD patients, such an acute onset, rapid progressive condition. Ganapathi *et al.* used a 6-component index which included total psoas volume to define frailty and proved that it can serve as an independent predictor of early and late mortality risk in patients undergoing proximal aortic surgery (24). Regrettably, with more than 50% CT data missing, the trustworthiness of the findings remain doubtful. The mechanism by which sarcopenia leads to a decreased survival in AAAD patients still needs further investigation. The resistance in muscle homeostasis and anabolic metabolism, as well as inflammation and mitochondrial dysfunction and could be the main reasons for poor prognosis (25). The catabolic state after surgery accelerates muscle loss, further leading to reduced physical activity and decreased physical function, resulting in significant functional limitations (26). This suggests a bidirectional association between sarcopenia and survival after surgery. At the same time, in patients undergoing aortic surgery with deep hypothermic circulatory arrest (DHCA), the incidence of neurological complications is relatively high and significantly impacts the prognosis. Neuromuscular

Table 3 Cox proportional hazards analysis for late mortality after propensity score matching

Parameters	Univariate analysis		Multivariate analysis	
	HR (95% CI)	P	HR (95% CI)	P
Age (years)	1.06 (1.01–1.09)	0.03	1.03 (1.01–1.05)	0.03
Male	1.03 (0.36–2.91)	0.96		
BMI (kg/m^2)	0.98 (0.86–1.12)	0.82		
Hypertension	1.64 (1.32–4.54)	0.05	2.06 (0.87–6.21)	0.08
Diabetes	1.35 (0.73–2.50)	0.34		
Previous CVA	2.60 (0.58–11.59)	0.21		
LVEF (%)	0.98 (0.96–1.00)	0.38		
Aortic valve regurgitation	1.09 (0.31–3.87)	0.90		
Pericardial effusion	1.50 (0.34–6.67)	0.59		
Preoperative malperfusion	1.95 (0.55–6.92)	0.04	2.35 (1.57–9.22)	0.02
Leucocytes (10^9/L)	1.07 (0.96–1.19)	0.23		
Hemoglobin (g/L)	0.99 (0.97–1.01)	0.57		
TBIL (U/L)	1.04 (0.95–1.14)	0.34		
Albumin (g/L)	0.99 (0.98–1.00)	0.37		
Urea (mmol/L)	0.99 (0.98–1.00)	0.25		
Creatinine (μmol/L)	1.15 (0.96–1.38)	0.13	1.25 (0.90–1.36)	0.11
No treatment	1.03 (0.30–1.57)	0.83		
Sinus plasty	1.29 (0.32–5.18)	0.72		
Bentall procedure	1.55 (0.39–6.19)	0.54		
CPB time (min)	1.01 (1.00–1.02)	0.04	1.01 (1.00–1.02)	0.03
ACC time (min)	1.01 (0.99–1.01)	0.36		
SACP time (min)	0.95 (0.84–1.07)	0.29		
Sarcopenia	2.86 (1.12–8.99)	0.01	2.73 (1.15–8.78)	0.009

HR, hazard ratio; CI, confidence interval; BMI, body mass index; CVA, cerebrovascular accident; LVEF, left ventricular ejection fraction; TBIL, total bilirubin; CPB, cardiopulmonary bypass; ACC, aortic cross-clamp; SACP, selective antegrade cerebral perfusion.

Table 4 Subgroup analysis of the correlation between PMTH and age

Variable	N	PMTH		P value	P value for interaction
		Low, HR (95% CI)	High		
Age					0.59
<65 years	217	2.21 (1.33–7.57)	1.0 (ref.)	0.02	
≥65 years	63	2.67 (1.10–9.61)	1.0 (ref.)	<0.001	

PMTH, psoas muscle thickness/height; HR, hazard ratio; CI, confidence interval.

system integrity impairment plays a crucial role in the decline of muscle strength, leading to muscle weakness (dynapenia) (27,28). This muscle weakness may further exacerbate functional impairments and decreased quality of life during the recovery period. With the accelerated aging of the population, the number of patients suffering from frailty is increasing. There has been an increasing interest in the use of sarcopenia as a tool to define frailty and to further be used for preoperative risk assessment. Conventional risk models in cardiac surgery, like the European System for Cardiac Operative Risk Evaluation II (EuroSCORE II) (29) and the German Registry for Acute Aortic Dissection Type A (GERAADA) score (30), traditionally focus only on characteristics of the disorders and specific medical comorbidities. Ignoring nutritional deficiency status and age-related systemic vulnerability is considered to have negative impacts on the prediction results. CT-based psoas muscle area has been used to determine the quantity and quality of muscle and impact of sarcopenia (31). However, volumetric measurement requires particular software and can be time-consuming. In this study, two cardiovascular surgeons read the CTA assessing the true lumen, intimal tears and extent of the dissection. At the same time, the PMTH could be rapidly measured without preoperative complex scoring process.

Sarcopenia was also found to be a prognostic factor for the postoperative severe complications in this study, especially renal failure, characterized by the loss of body protein (muscle) and fuel reserves (fat) due to catabolic inflammation (22), seriously affecting the quality of life and long-term survival of patients. At the same time, sarcopenia may also be related to patients' baseline renal function. Wilkinson *et al*. found that the prevalence of sarcopenia among participants with declining renal function (defined as eGFR <60 mL/min/1.73 m^2) may be 9.7%, which is approximately twice that of non-CKD patients (32). Different from other conditions, patients who are diagnosed AAAD have to receive surgery as soon as possible. The regimen for frail can be applied only during the rehabilitation phase. Available evidence suggests that nutritional treatment in addition to resistance training may improve the skeletal muscle mass and thus the ability to perform activities of daily living (33). In elderly perioperative patients with a diagnosis of sarcopenia, a simplify surgical step and a more aggressive nutritional intervention will profit more. The most important of all, determinating the cause of loss of muscle mass and appropriate management is necessary.

Limitation

Several limitations of this study should be noted. On top of all of these, the retrospective nature of this study introduces inherent biases, causality cannot be determined. Currently, there is a lot of research on sarcopenia in cardiovascular disease patients, studies using standardized psoas muscle thickness for diagnosis are relatively limited. Therefore, there is controversy over the cut-off value used for grouping. In this study, we adopted the commonly reported cut-off value of 16.8 mm/m. In terms of measurement, we acknowledge that there is a degree of subjectivity involved in this method. In patients with an anomaly of the vertebrae, an exact psoas muscle level cannot be easily determined. Furthermore, in elderly patients, compression fractures of the vertebrae are relatively common. In the meantime, the cut-off values for sarcopenia potentially differ among races, sexes, and age groups. And it is difficult to identify a definition that could be applied to all populations. Systemic inflammation has a close relationship with sarcopenia/muscle wasting (34). In this study, the number of AAAD patients with Marfan syndrome, Behcets disease and syphilitic aortitis included was limited.

Conclusions

Sarcopenia defined from the PMTH was associated with short- and long-term survival after AAAD surgery. Preoperative CT measurement of the psoas muscle thickness can be a useful tool for quick identification of patients at high risk.

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Footnote

Reporting Checklist: The authors have completed the STROBE reporting checklist. Available at https://jtd.amegroups.com/article/view/10.21037/jtd-24-196/rc

Data Sharing Statement: Available at https://jtd.amegroups.com/article/view/10.21037/jtd-24-196/dss

Peer Review File: Available at https://jtd.amegroups.com/article/view/10.21037/jtd-24-196/prf

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://jtd.amegroups.com/article/view/10.21037/jtd-24-196/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). This study was approved by the Medical Ethics Committee of Fujian Medical University Union Hospital (No. 2021KY0127), and individual consent for this retrospective analysis was waived.

References

1. Delmonico MJ, Harris TB, Visser M, et al. Longitudinal study of muscle strength, quality, and adipose tissue infiltration. Am J Clin Nutr 2009;90:1579-85.
2. Cruz-Jentoft AJ, Landi F, Topinková E, et al. Understanding sarcopenia as a geriatric syndrome. Curr Opin Clin Nutr Metab Care 2010;13:1-7.
3. Auyeung TW, Lee JS, Leung J, et al. The selection of a screening test for frailty identification in community-dwelling older adults. J Nutr Health Aging 2014;18:199-203.
4. Tanimoto Y, Watanabe M, Sun W, et al. Association between sarcopenia and higher-level functional capacity in daily living in community-dwelling elderly subjects in Japan. Arch Gerontol Geriatr 2012;55:e9-13.
5. Okamura H, Kimura N, Tanno K, et al. The impact of preoperative sarcopenia, defined based on psoas muscle area, on long-term outcomes of heart valve surgery. J Thorac Cardiovasc Surg 2019;157:1071-1079.e3.
6. Kiriya Y, Toshiaki N, Shibasaki I, et al. Sarcopenia assessed by the quantity and quality of skeletal muscle is a prognostic factor for patients undergoing cardiac surgery. Surg Today 2020;50:895-904.
7. Kärkkäinen JM, Oderich GS, Tenorio ER, et al. Psoas muscle area and attenuation are highly predictive of complications and mortality after complex endovascular aortic repair. J Vasc Surg 2021;73:1178-1188.e1.
8. Drudi LM, Phung K, Ades M, et al. Psoas Muscle Area Predicts All-Cause Mortality After Endovascular and Open Aortic Aneurysm Repair. Eur J Vasc Endovasc Surg 2016;52:764-9.
9. Durand F, Buyse S, Francoz C, et al. Prognostic value of muscle atrophy in cirrhosis using psoas muscle thickness on computed tomography. J Hepatol 2014;60:1151-7.
10. Huguet A, Latournerie M, Debry PH, et al. The psoas muscle transversal diameter predicts mortality in patients with cirrhosis on a waiting list for liver transplantation: A retrospective cohort study. Nutrition 2018;51-52:73-9.
11. Gu DH, Kim MY, Seo YS, et al. Clinical usefulness of psoas muscle thickness for the diagnosis of sarcopenia in patients with liver cirrhosis. Clin Mol Hepatol 2018;24:319-30.
12. Paternostro R, Lampichler K, Bardach C, et al. The value of different CT-based methods for diagnosing low muscle mass and predicting mortality in patients with cirrhosis. Liver Int 2019;39:2374-85.
13. Zhan C, Yang X, Song X, et al. Radiotherapy vs surgery for T1-2N0M0 laryngeal squamous cell carcinoma: A population-based and propensity score matching study. Cancer Med 2018;7:2837-47.
14. Cruz-Jentoft AJ, Bahat G, Bauer J, et al. Sarcopenia: revised European consensus on definition and diagnosis. Age Ageing 2019;48:601.
15. Mamane S, Mullie L, Piazza N, et al. Psoas Muscle Area and All-Cause Mortality After Transcatheter Aortic Valve Replacement: The Montreal-Munich Study. Can J Cardiol 2016;32:177-82.
16. Hervochon R, Bobbio A, Guinet C, et al. Body Mass Index and Total Psoas Area Affect Outcomes in Patients Undergoing Pneumonectomy for Cancer. Ann Thorac Surg 2017;103:287-95.
17. Trimarchi S, Nienaber CA, Rampoldi V, et al. Contemporary results of surgery in acute type A aortic dissection: The International Registry of Acute Aortic Dissection experience. J Thorac Cardiovasc Surg 2005;129:112-22.
18. Zhu Y, Lingala B, Baiocchi M, et al. Type A Aortic Dissection-Experience Over 5 Decades: JACC Historical Breakthroughs in Perspective. J Am Coll Cardiol 2020;76:1703-13.
19. Nienaber CA, Clough RE, Sakalihasan N, et al. Aortic

dissection. Nat Rev Dis Primers 2016;2:16053.
20. Carmeli E, Moas M, Reznick AZ, et al. Matrix metalloproteinases and skeletal muscle: a brief review. Muscle Nerve 2004;29:191-7.
21. Sabatino A, Cuppari L, Stenvinkel P, et al. Sarcopenia in chronic kidney disease: what have we learned so far? J Nephrol 2021;34:1347-72.
22. Yajima T, Arao M, Yajima K, et al. Usefulness of computed tomography-measured psoas muscle thickness per height for predicting mortality in patients undergoing hemodialysis. Sci Rep 2021;11:19070.
23. Li T, Liu J, Zhao J, et al. Sarcopenia Defined by Psoas Muscle Thickness Predicts Mortality After Transjugular Intrahepatic Portosystemic Shunt. Dig Dis Sci 2023;68:1641-52.
24. Ganapathi AM, Englum BR, Hanna JM, et al. Frailty and risk in proximal aortic surgery. J Thorac Cardiovasc Surg 2014;147:186-191.e1.
25. The World Health Organization Quality of Life Assessment (WHOQOL): development and general psychometric properties. Soc Sci Med 1998;46:1569-85.
26. Sasaki KI, Kakuma T, Sasaki M, et al. The prevalence of sarcopenia and subtypes in cardiovascular diseases, and a new diagnostic approach. J Cardiol 2020;76:266-72.
27. Clark BC. Neuromuscular Changes with Aging and Sarcopenia. J Frailty Aging 2019;8:7-9.
28. Clark BC, Carson RG. Sarcopenia and Neuroscience: Learning to Communicate. J Gerontol A Biol Sci Med Sci 2021;76:1882-90.
29. Nashef SA, Roques F, Sharples LD, et al. EuroSCORE II. Eur J Cardiothorac Surg 2012;41:734-44; discussion 744-5.
30. Czerny M, Siepe M, Beyersdorf F, et al. Prediction of mortality rate in acute type A dissection: the German Registry for Acute Type A Aortic Dissection score. Eur J Cardiothorac Surg 2020;58:700-6.
31. Hanaoka M, Yasuno M, Ishiguro M, et al. Morphologic change of the psoas muscle as a surrogate marker of sarcopenia and predictor of complications after colorectal cancer surgery. Int J Colorectal Dis 2017;32:847-56.
32. Wilkinson TJ, Miksza J, Yates T, et al. Association of sarcopenia with mortality and end-stage renal disease in those with chronic kidney disease: a UK Biobank study. J Cachexia Sarcopenia Muscle 2021;12:586-98.
33. Yoshimura Y, Uchida K, Jeong S, et al. Effects of Nutritional Supplements on Muscle Mass and Activities of Daily Living in Elderly Rehabilitation Patients with Decreased Muscle Mass: A Randomized Controlled Trial. J Nutr Health Aging 2016;20:185-91.
34. Nelke C, Dziewas R, Minnerup J, et al. Skeletal muscle as potential central link between sarcopenia and immune senescence. EBioMedicine 2019;49:381-8.

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