POOR PROGNOSIS LINKED TO REDUCED MUSCLE MASS IN HEMODIALYSIS PATIENTS IS MAINLY CONFINED TO ELDERLY MEN

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Introduction and aim

Reduced muscle mass, an independent risk factor for mortality in the general population, is prevalent in hemodialysis (HD) patients but its impact on survival in HD patients is not clear. Here we investigated relations between age, gender, systemic inflammation, nutritional status including muscle mass [assessed by bio-electrical impedance analysis, BIA] in HD patients and analyzed how these factors associated with clinical outcome.

Materials and Methods

In 224 HD patients (137 men, mean age 65.5 years and median dialysis vintage time 5.8 (2.9-9.8) years) recruited during 2009-2015 and then followed prospectively for up to 5-years, low muscle mass (by BIA-appendicular muscle mass index, ASMI) was defined according to criteria postulated by the Asian Working Group for Sarcopenia (AWGS) in Older People: ASMI cutoffs for low muscle mass were defined as values two standard deviations (SD) below sex-specific means in a young reference population (7.0 kg/m^2 in men and 5.7 kg/m^2 in women). During follow-up for up to 65 months, 59 HD patients died (including 13 deaths due to cancer). Associations between low muscle mass and subsequent mortality risk over a mean follow-up period of 45 months were assessed.

Results: Results are shown in **Figures 1-3** and in **Tables 1-3**.

Fig.1 Classification in hemodialysis patients (n=224)

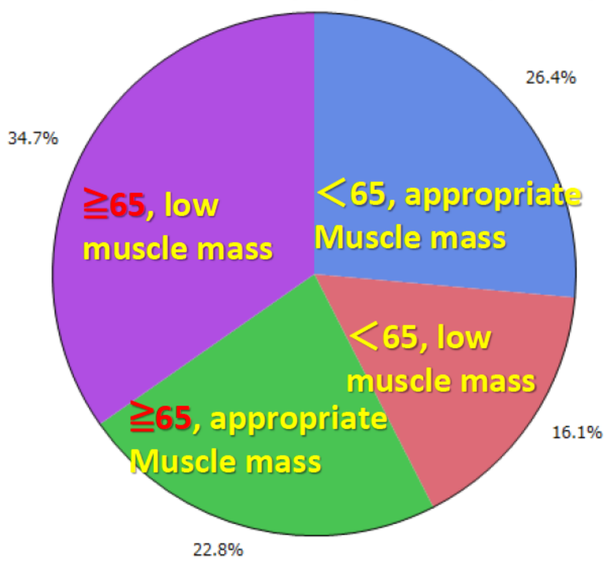


Table 1. Clinical characteristics according to the presence of low muscle mass. Differences were assessed by the nonparametric Mann–Whitney test for continuous variables and a χ^2 test for nominal variables.

	appropriate MM	low MM	p-value
Patients, n (%)	106 (48)	116 (52)	n.s
Age, years	**63 (55-69)**	**71 (64-78)**	<0.0001
Sex, men (%)	52	48	n.s
Diabetes mellitus, %	52	48	n.s
CVD presence, %	9 (60)	6 (40)	n.s
GNRI*	**95.3 (92.0-98.4)**	**91.0 (86.2-94.2)**	<0.0001
KT/V	**1.64 (1.46-1.83)**	**1.75 (1.60-1.96)**	0.0007
BMI, kg/m^2	**22.2 (20.6-26.8)**	**19.7 (18.2-21.4)**	<0.0001
Vintage, years	6.25 (3.06-10.9)	5.00 (2.58-8.92)	0.17
s-albumin, g/L	**3.7 (3.5-4.0)**	**3.6 (3.4-3.8)**	0.012
Hemoglobin, g/L	10.7 (9.8-11.2)	10.6 (9.5-11.4)	0.85
s-creatinine, mg/dl	**8.18 (6.16-9.52)**	**6.79 (5.15-8.53)**	0.0012
Cholesterol, mg/dl	158 (137-189)	162 (144-186)	0.36
CRP, mg/dl	**0.1 (0-0.3)**	**0.2 (0.1-0.6)**	0.004

Data are expressed as [a]median (range), [b]median (10th to 90th percentile), or as mean ± SD or n (%).
MM, muscle mass; CVD, cardiovascular disease; GNRI, geriatric nutritional risk index; BMI, body mass index; CRP, C-reactive protein

Figure 2. All cause mortality according to the presence of low muscle mass.

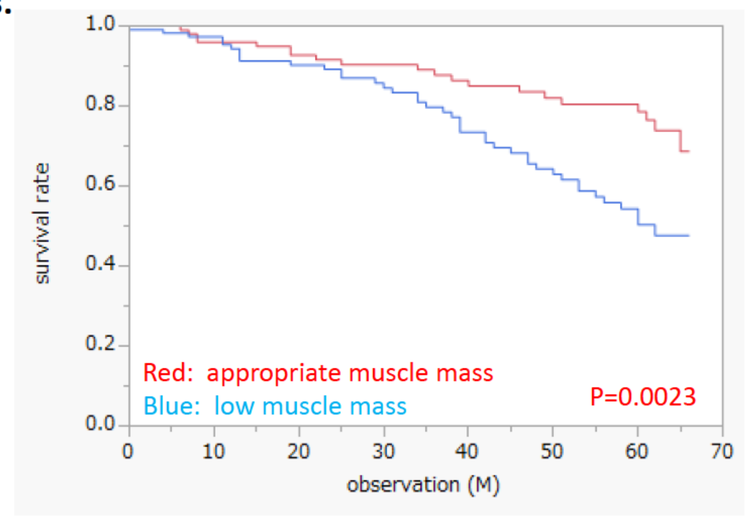
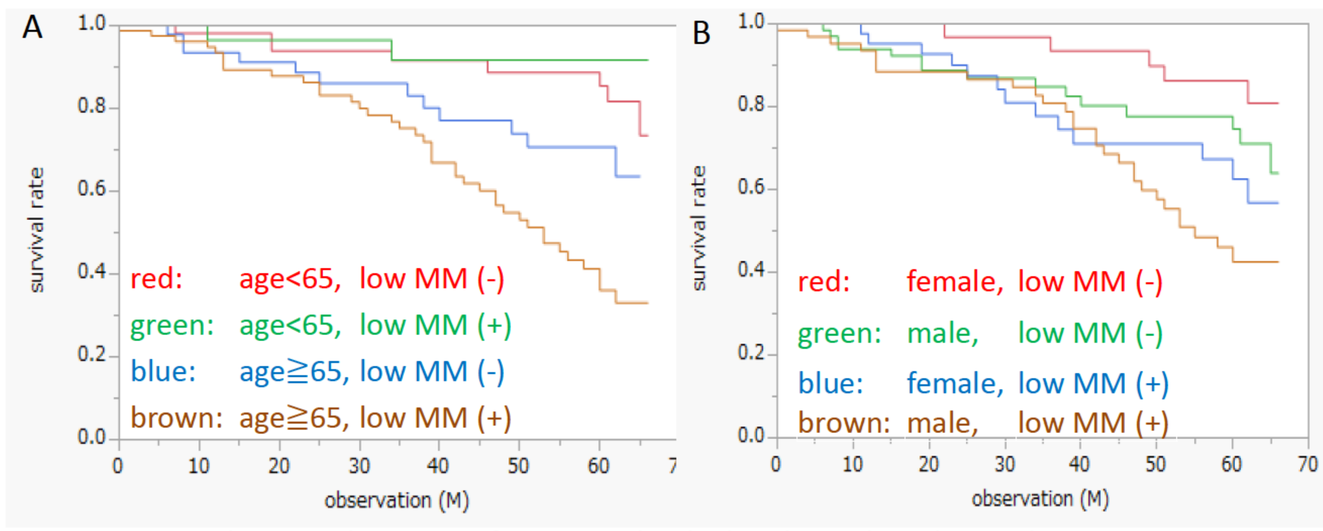


Figure 3. All cause mortality according to the presence/abcence of low muscle mass and high/low age (panel A) or gender (panel B).



The mortality except for cancer death also showed similar tendency.

Table 2a. Hazard ratios (HR) and 95% confidence intervals (CI) after categorization regarding age (panel A) or gender (panel B), and the presence of low muscle mass (MM) in HD patients.

A	age and presence of low MM	Hazard ratio (95% CI)	p value
	<65 - v.s. <65 +	2.24 (0.56 - 14.9)	0.2711
	>65 + v.s. >65 -	**2.20 (0.11 - 1.19)**	**0.011**
	>65 + v.s. <65 +	**9.54 (2.93 - 58.6)**	**<0.0001**
	>65 - v.s. <65 +	4.34 (1.18 - 27.9)	0.0247
	>65 - v.s. <65 -	1.93 (0.80 - 4.93)	0.1439
B	**gender and presence of low MM**		
	female + v.s. female -	**2.67 (1.01 - 8.35)**	**0.0481**
	male - v.s. female -	2.13 (0.82 - 6.54)	0.1235
	male + v.s. female +	1.55 (0.82 - 3.09)	0.1764
	male + v.s. male -	**1.96 (1.06 - 3.75)**	**0.0303**
	female + v.s. male -	1.26 (0.59 - 2.65)	0.5452

Table 2b. Hazard ratios (HR) and 95% confidence intervals (CI) for the mortality except for cancer death in relation to gender and the presence of low muscle mass.

B'	gender and presence of low MM	Hazard ratio (95% CI)	p value
	female + v.s. female -	**1.97 (0.70 - 6.41)**	**0.2145**
	male - v.s. female -	1.68 (1.61 - 5.32)	0.326
	male + v.s. female +	1.77 (0.85 - 4.04)	0.1331
	male + v.s. male -	2.08 (1.04 - 4.43)	0.0393
	female + v.s. male -	1.47 (0.47 - 2.84)	0.721

Table 3. Uni- and Multivariate logistic models examining predictors of death in 83 aged male (panel A) and 52 aged female (panel B) HD patients.

A	**>65, male (n=83)**						
	parameter	univiriate			multivariate		
		odds ratio	95% CI	p value	odds ratio	95% CI	p value
	presence of low MM	3.36	1.32 - 9.24	0.01	3.44	1.26 - 10.2	0.015
	presence of DM	1.18	0.49 - 2.86	0.71			
	BMI (> 21.4)	2.1	0.88 - 5.12	0.1			
	GNRI (< 91)	2.27	0.92 - 5.69	0.07			
	Kt/V (< 1.59)	2.21	0.89 - 5.76	0.09			
	Total choresterol (> 161)	1.49	0.61 - 3.74	0.38			
	CRP (>0.4)	1.57	0.64 - 4.00	0.33			
						Pseudo r^2= 0.14	
B	**>65, female (n=52)**						
	parameter	univiriate			multivariate		
		odds ratio	95% CI	p value	odds ratio	95% CI	p value
	presence of low MM	1.8	0.54 - 6.67	0.34			
	presence of DM	1.35	0.42 - 4.49	0.62			
	BMI (> 21.4)	1.42	0.42 - 5.29	0.58			
	GNRI (< 91)	2.75	0.85 - 9.65	0.09			
	Kt/V (< 1.59)	1.55	0.28 - 8.00	0.6			
	Total choresterol (> 161)	2.99	0.91-10.4	0.07			
	CRP (>0.4)	11.2	3.05 - 112	0.0004	21	3.31 - 221	0.0007
						Pseudo r^2= 0.30	

According to analysis by the receiver operating characteristics (ROC) curve, the cut off value of BMI, GNRI, Kt/V, Total choresterol and CRP as predictor of all-cause mortality was respectively determined.

Summary and conclusions

In HD patients, low muscle mass carries an increased mortality risk which is mainly confined to men above 65 years of age. Therapeutic strategies targeting low muscle mass therefore need to be stratified according to age and gender in HD patients.

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