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Abdominal Subcutaneous Fat Area can Predict 2-Year Survival in Patients with End- stage Renal Disease Initiating Hemodialysis

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Objectives : Obesity and adipose tissue are considered "baddies" associated with adverse outcomes such as cardiovascular and metabolic diseases. However, the obesity paradox is obesity that may provide survival benefits for chronic diseases including patients undergoing hemodialysis. Fat mass can be a surrogate marker for nutrition status in patients undergoing hemodialysis. Thus, this study evaluated subcutaneous fat and all-cause mortality in patients initiating hemodialysis.
Methods : A total of 123 patients initiating hemodialysis were included in this study. MATLAB (version R2014a) was used to identify subcutaneous fat area (SFA) and visceral fat area (VFA) in computed tomography images for the analysis of body composition. Based on SFA, patients were divided into 2 groups. The survival rate was calculated using Cox regression analysis.
Results : The mean SFA, VFA, and BMI were 108.17 ± 26.37, 143.87 ± 91.38, and 23.83 ± 4.52, respectively. SFA groups were divided into two groups by cut-off value calculated by ROC analysis. (Table 1). The Kaplan–Meier survival rates were 70.0% and 85.7% in the low and high subcutaneous fat area (SFA) groups, respectively (log rank, p = 0.021). In Cox analysis, the low SFA group showed high risk for all-cause mortality than the high SFA group (hazard ratio (HR) 3.541, 95% CI 1.358–9.235, p = 0.010). In subgroup univariate analysis, the risk for all-cause mortality was higher in patients with low SFA and diabetes than those with high SFA and diabetes (HR 3.541, 95% CI 1.358–9.235, p = 0.010). In multivariate analysis, the risk for all-cause mortality was higher in patients with low SFA and diabetes than those with high SFA and diabetes (HR 4.615, 95% CI 1.484–14.351, p = 0.008).
Conclusions : Conclusively, low SFA increases the risk of 2-year all-cause mortality, and SFA analysis can provide information for risk evaluation for patients initiating hemodialysis.

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Table 1. Baseline characteristics of low SFA and high SFA groups

	Subcutaneous fat area (cm²)			
	Total (n = 123)	low SFA group	high SFA group	*p**
		(n = 60)	(n = 63)	
Age (years)	64.12 ± 14.33	67.31 ± 13.70	61.07 ± 14.36	0.015
Sex (male, %)	69(56.1)	18(30.0)	51(81.0)	<0.001
Waist (cm)	91.08 ± 12.29	86.63 ± 12.05	95.31 ±11.03	<0.001
BMI (kg/m²)	23.83 ± 4.52	21.52 ± 3.62	25.93 ±4.24	<0.001
SFA (cm²)	108.17 ± 26.37	86.43 ± 14.44	128.88 ±16.66	<0.001
VFA (cm²)	143.87 ± 91.38	128.20 ± 85.72	158.79 ±94.73	0.063
DM (yes, %)	84(68.3)	39(65.0)	45(71.4)	0.561
Hypertension (%)	102(82.9)	45(75.0)	57(90.5)	0.003
Triglyceride (mg/dL)	143.79 ± 91.30	133.07 ± 91.32	153.48 ±90.92	0.313
Total cholesterol (mg/dL)	143.08 ± 55.82	144.69 ± 46.59	151.09 ±63.12	0.686
HDL-cholesterol(mg/dL)	41.80 ±16.35	42.85 ± 15.14	40.85 ±17.44	0.509
WBC (10³/mm³)	8.73 ± 4.99	9.57 ± 6.35	7.91 ±3.12	0.067
Lymphocyte# (10³/mm³)	1.24 ± 0.56	1.07 ±0.54	1.39 ±0.53	0.001
Hemoglobin (g/dL)	9.49 ± 1.48	9.51 ± 1.57	9.47 ± 1.39	0.892
Hs-CRP (mg/dL)	1.69 ± 3.65	2.36 ± 4.71	1.05 ± 2.08	0.046
Total protein (g/dL)	6.21 ± 0.98	6.12 ± 1.13	6.30 ± 0.81	0.319
Albumin (g/dL)	3.58 ± 0.64	3.54 ± 0.63	3.62 ± 0.64	0.490
BUN (mg/dL)	80.70 ± 29.88	82.37 ± 33.44	79.11 ± 26.22	0.547
Cr (mg/dL)	7.34 ± 3.29	6.56 ± 2.98	8.08 ± 3.43	0.010
eGFR (mL/min/1.73 m²)	9.65 ± 8.15	11.15 ± 10.77	8.22 ± 4.03	0.046
Glucose (mg/dL)	150.87 ± 69.70	152.00 ± 78.34	149.0 ± 60.93	0.762
HbA1c (%)	7.44 ± 8.89	8.30 ± 12.75	6,64 ±1.42	0.309
Uric acid (mg/dL)	7.54 ± 6.91	6.79 ± 2.53	8.24 ± 9.32	0.247
Ferritin (ng/mL)	377.46 ± 340.34	415.62 ± 361.15	339.93 ± 317.10	0.227
Nutrition status				
CONUT score	4.24 ± 2.52	4.64 ± 2.88	3.87 ±2.09	0.092
PNI	42.08 ± 7.53	40.84 ± 8.17	43.26 ±6.71	0.076

Table 2. Crude and multivariate Cox regression analyses

	Hazard ratio (95% CI)	*p* value
Crude	3.105 (1.356–7.113)	0.005
Model 1	2.229 (0.878–5.663)	0.092
Model 2	1.849(0.712–4.799)	0.207

Model 1 includes age, sex, SFA grade, visceral fat, DM, HTN, Hb, BUN, Cr, total protein, albumin, glucose, Tchol, TG, HDL-CCRP, and BMI.
Model 2 includes all variables in Model 1 + CONUT score and PNI.

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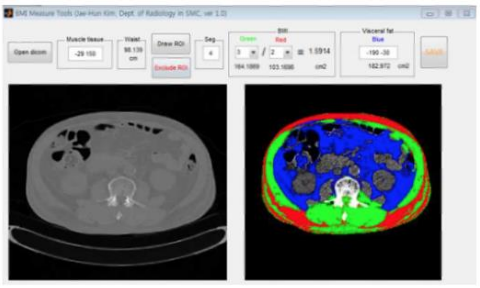

Figure 1. CT Semiquantitative body mass index and subcutaneous fat computed tomography analysis.

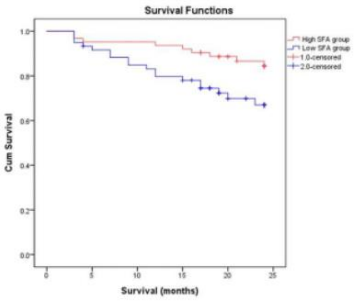

Figure 2. Kaplan–Meier survival curve of SFA groups. low and high SFA groups, low and high VFA groups.