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Differences in muscle quantity and quality according to smoking status and associations with CVD

[1]Dae-young Kim, MD, [1]Chung Reen Kim, MD, PhD, [2]Youngjee Jeon, MD, PhD,
[1] Ulsan University Hospital, Department of Rehabilitation Medicine
[2] Ulsan University Hospital, Department of Family Medicine

Background

- Obesity and smoking are the leading causes of preventable morbidity and mortality worldwide, and the relationship between obesity and smoking is complex.
- In previous studies, obese current and former smokers both had a higher risk of cardiovascular disease (CVD) mortality than nonsmokers with normal BMI.
- However, unfortunately, these studies only analyzed the abdominal muscle area, and there was no information on muscle density reflecting muscle quality.
- Thus, we tried to evaluate if smoking significantly modifies the associations between skeletal muscle quantity and quality with CVD morbidity and mortality.

Method

- We included 1,934 participants with complete data for cigarette smoking history among a MESA (Multi-Ethnic Study of Atherosclerosis) ancillary study on abdominal body composition, inflammation, and cardiovascular disease and underwent abdominal CT scans.
- The associations between abdominal muscle area, density, and intermuscular fat area with incident CVD were assessed using the multivariable Cox proportional hazards model.
- And we analyzed using multiplicative interaction to determine if smoking status significantly modifies the obesity and muscle associations.

Table 1. General characteristics of study participants

Men	Overall (N=973)	Smoking status		
		Never smoker	Former smoker	Current smoker
Age, years	64.2 ± 9.9	62.8 ± 10.0	66.1 ± 9.5	60.6 ± 9.2
Race, n(%)				
White	407 (41.8)	144 (41.7)	219 (43.5)	44 (35.2)
Chinese American	133 (13.7)	60 (17.4)	64 (12.7)	9 (7.2)
African American	179 (18.4)	52 (15.1)	97 (19.3)	30 (24.0)
Hispanic	254 (26.1)	89 (25.8)	123 (24.5)	42 (33.6)
Abdominal muscle density, Hu	42.3 ± 3.3	42.5 ± 3.1	42.1 ± 3.4	42.5 ± 3.1
Abdominal muscle area, cm2	235.1 ± 37.9	229.1 ± 35.9	235.3 ± 37.3	251.6 ± 41.1
Intermuscular fat area, cm2	19.4 ± 10.1	17.8 ± 8.7	20.3 ± 10.4	20.2 ± 12.0
Abdominal visceral fat area, cm2	195.4 ± 84.5	188.0 ± 81.8	201.2 ± 86.2	193.9 ± 84.9

Women	Overall (N=961)	Smoking status		
		Never smoker	Former smoker	Current smoker
Age, years	65.1 ± 9.4	65.6 ± 9.6	66.0 ± 8.8	59.0 ± 7.8
Race, n(%)				
White	369 (38.4)	166 (30.5)	157 (48.6)	46 (49.5)
Chinese American	119 (12.4)	117 (21.5)	1 (0.3)	1 (1.1)
African American	225 (23.4)	111 (20.4)	85 (26.3)	29 (31.2)
Hispanic	248 (25.8)	151 (27.7)	80 (24.8)	17 (18.3)
Abdominal muscle density, Hu	40.0 ± 3.2	39.8 ± 3.3	40.1 ± 3.1	40.8 ± 2.9
Abdominal muscle area, cm2	181.7 ± 34.0	174.9 ± 32.8	188.9 ± 32.7	198.9 ± 34.
Intermuscular fat area, cm2	20.7 ± 11.6	19.7 ± 10.6	22.7 ± 12.7	19.9 ± 12.6
Abdominal visceral fat area, cm2	131.9 ± 66.6	128.7 ±63.2	139.9 ± 72.2	122.8 ± 63.8

Results

Table 2. Multivariable Cox proportional hazards model according to sex (outcome: Hard CVD)

Men				
	B	SE	HR	p-value
Abdominal muscle area X smoking status				
Model 1	0.003	0.004	1.003 (0.996-1.011)	0.353
Model 2	0.002	0.004	1.002 (0.995-1.010)	0.521
Model 3	0.004	0.004	1.004 (0.996-1.013)	0.352
Model 4	0.004	0.004	1.004 (0.995-1.013)	0.368
Abdominal muscle density X smoking status				
Model 1	0.031	0.046	1.032 (0.942-1.129)	0.500
Model 2	0.015	0.050	1.016 (0.921-1.119)	0.755
Model 3	0.040	0.053	1.041 (0.938-1.156)	0.451
Model 4	0.036	0.053	1.037 (0.935-1.150)	0.492
Intermuscular fat area X smoking status				
Model 1	0.007	0.011	1.007 (0.985-1.029)	0.550
Model 2	0.012	0.012	1.012 (0.988-1.037)	0.316
Model 3	0.010	0.013	1.010 (0.985-1.036)	0.431
Model 4	-0.001	0.016	0.999 (0.968-1.030)	0.929

Women				
	B	SE	HR	p-value
Abdominal muscle area X smoking status				
Model 1	-0.002	0.005	0.998 (0.989-1.007)	0.644
Model 2	-0.003	0.004	0.997 (0.988-1.006)	0.533
Model 3	-0.001	0.005	0.999 (0.990-1.009)	0.880
Model 4	-0.001	0.005	0.999 (0.990-1.009)	0.864
Abdominal muscle density X smoking status				
Model 1	0.001	0.051	1.001 (0.907-1.105)	0.981
Model 2	0.002	0.051	1.002 (0.906-1.108)	0.969
Model 3	0.015	0.056	1.015 (0.909-1.134)	0.793
Model 4	0.004	0.056	1.004 (0.899-1.121)	0.947
Intermuscular fat area X smoking status				
Model 1	-0.001	0.010	0.999 (0.979-1.020)	0.946
Model 2	0.001	0.010	1.001 (0.982-1.021)	0.925
Model 3	0.005	0.011	1.005 (0.984-1.026)	0.648
Model 4	-0.007	0.012	0.993 (0.970-1.018)	0.597

Model 1, age, ethnicity, smoking status, BMI, and abdominal muscle area or abdominal muscle density or intermuscular fat area; Model 2, + hypertension, diabetes, statin use, total cholesterol, HDL-cholesterol, systolic blood pressure, physical activity, alcohol use, and visceral fat area; Model3, + hs-CRP, IL-6, leptin, adiponectin, educational level, and gross family income; Model 4, + intermuscular fat area, abdominal muscle area, and abdominal muscle density

- As a result, abdominal muscle area, density, or intermuscular fat was not significantly associated with CVD morbidity and mortality in this cohort group.
- Also, smoking status also didn't affect or modify the obesity and muscle associations.

Conclusions

- Therefore, in this study, we couldn't find any differences in abdominal skeletal muscle quantity and quality according to smoking status and their associations with CVD events in the MESA cohort.