

Ultrasound measures of muscle quantity and quality for evaluating muscle mass, strength and physical performance: a preliminary analysis

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Background:

Ultrasound is a promising tool for muscle assessment in sarcopenia, and has been used to evaluate both muscle quantity and quality. The SARCUS consensus protocol has proposed standardised ultrasonographic muscle measures, but the relationships between these ultrasonographic measures with indicators of muscle mass and function require further investigation.

Objectives:

To examine the associations between ultrasound-measured muscle quantity and quality with outcomes of muscle mass, strength, and physical performance.

Methods:

Cross-sectional study of 41 independent community-dwelling older adults (mean age: 67.0±5.9 years). We performed rectus femoris ultrasound in accordance with the SARCUS protocol to derive two parameters of muscle quantity [muscle thickness (MT) and cross-sectional area(CSA)] and three of muscle quality [pennation angle(PA), fascicle length(FL) and echointensity(EI)]. We performed correlation analysis with muscle mass [bioelectrical impedance analysis-derived appendicular lean mass adjusted for height-square(ALM)], handgrip strength, and physical performance [gait speed and Short Physical Performance Battery (SPPB)]. We conducted multiple linear regression analyses to examine the associations with the aforementioned outcomes, adjusted for age, gender, and nutritional status (Mini-Nutritional Assessment, MNA).

Results:

Amongst the SARCUS ultrasound parameters, we observed moderate correlation between CSA with ALM ($r=0.69$, $P<0.001$) and significant, albeit weak correlation with gait speed ($r=0.36$, $P=0.023$). There were significant correlations between MT with ALM ($r=0.32$, $P=0.045$) and SPPB ($r=0.34$, $P=0.025$), and FL with SPPB ($r=0.35$, $P=0.027$). Multiple linear regression analyses revealed a significant association between CSA and ALM ($\beta=0.36$, 95% CI 0.20-0.51, $P<0.001$), which remained significant after adjustment for age, gender and MNA ($\beta=0.21$, 95% CI 0.040-0.38, $P=0.017$). There was no significant association for the remaining ultrasound measurements.

Discussion and Conclusion:

In this preliminary analysis, we found varying associations between ultrasonographic measures of muscle quantity with muscle mass and physical performance, but not with muscle quality. Further research is required to delineate the role of muscle ultrasound for sarcopenia assessment.