Skeletal Muscle Quality: Concordant Findings from Two Practical Non-Invasive Approaches

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Abstract

Background: Phase angle (θ), derived from bioelectrical impedance analysis (BIA) resistance and reactance, decreases with adult age and is associated with changes in nutritional status, skeletal muscle (SM) function, and insulin resistance. Another measure of SM quality is the light fraction (LF) measured with ultrasound (US) followed by image processing; echogenic light SM is produced with fat and fibrous tissue infiltration of normally dark SM. While BIA systems automatically measure θ, technical training is needed for operation of the US system and subsequent image analysis.

Methods: The aim of this study was to examine the associations between these two age-related measures of SM quality: θ at 50 KHz using an 8-electrode multifrequency BIA system (MC980, Tanita Corp., Tokyo, Japan); US (GE LOGIC). Subjects were 165 males and females, ages 5-80 yrs, with US measures of biceps, triceps, calf, and thigh muscles, and θ measures of each arm and leg.

Results: Significant correlations (p<0.05) were present for key associations, including: bicep LF and arm θ; triceps LF and arm θ; thigh LF and leg θ; age and biceps and thigh LF, and leg θ. Our findings thus show concordant relations between the two different measures of SM quality, θ and LF.

Conclusions: Measurement of θ may be a simple, practical, and clinically-useful measure of age-related changes in SM quality that can be studied in the context of sarcopenia and related metabolic disorders.

Results

θ and LF are concordant for SM quality

Objectives

To examine the associations between these two age-related measures of SM quality.

Methods

θ at 50 KHz using an 8-electrode multifrequency BIA system (MC980, Tanita Corp., Tokyo, Japan); US (GE LOGIC e, Milwaukee, Wisconsin; Nikon NIS Elements Advanced Research 3.22.11, Melville, NY).

Subjects were 165 males and females, ages 5-80 years, with US measures of biceps, triceps, calf, and thigh muscles; and θ measures of each arm and leg.

<table>
<thead>
<tr>
<th>Phase angle (θ)</th>
<th>Light fraction (LF)</th>
</tr>
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<tbody>
<tr>
<td>Arm</td>
<td>0.06</td>
</tr>
<tr>
<td>Leg</td>
<td>0.41</td>
</tr>
<tr>
<td>Biceps</td>
<td>0.16</td>
</tr>
<tr>
<td>Triceps</td>
<td>0.06</td>
</tr>
<tr>
<td>Thigh</td>
<td>0.17</td>
</tr>
<tr>
<td>Calf</td>
<td>0.07</td>
</tr>
</tbody>
</table>

Significant correlations (p<0.05) were present for key associations, including: biceps LF and arm θ; triceps LF and arm θ; thigh LF and leg θ; age and biceps and thigh LF, and leg θ.

Conclusions

Our findings show concordant relations between the two different measures of SM quality, θ and LF.

Measurement of θ may be a simple, practical, and clinically-useful measure of age-related changes in SM quality.

References