Response to: “The use of ultrasound for the estimation of muscle mass: one site fits most?”

Willemke Nijholt, Harriët Jager-Wittenaar, Aldo Scafoglieri, Hans Hobbelen, Cees P. van der Schans

The use of ultrasound for the estimation of muscle mass: one site fits most?

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During the last two decades, DXA-derived appendicular lean soft tissue mass has served as a major criterion for diagnosing the age-related loss of skeletal muscle mass (i.e. sarcopenia). From a clinical perspective, however, DXA measurements are costly, and the device has limited availability. A possible alternative method for measuring muscle size (e.g. muscle thickness) in humans may be B-mode ultrasound. It is well known that ultrasound is a non-invasive, quick, valid, and reliable imaging technique to estimate muscle thickness in muscles of the extremity and trunk.

With this in mind, we read with great interest the article by Nijholt and colleagues, where they reported the validity and reliability of ultrasound to quantify musculature in older adults. The authors also reported on two prediction equations for estimating DXA-derived muscle mass. Although not reported within this paper, we previously noted that two of those prediction equations selected by Nijholt et al. included systematic error. Over the last couple of years, we have published several prediction equations for estimating DXA-derived appendicular lean mass in older adults. Unfortunately, those equations were not included in the article by Nijholt et al. Interestingly, a single site measurement of forearm muscle thickness was found to be good predictor of DXA-derived lean soft tissue mass in older Caucasian adults, and the equation was also found to be accurate in older Japanese adults. Notably, the standard error of the estimate was 1.95 kg for the equation that used a single muscle thickness site, whereas the standard error of the estimate of the equation that included eight predictors was 1.13 kg. The amount of time required for a single ultrasound measurement is generally less than 1 min per person, so this estimate appears both valid and pragmatic.

In summary, our previous studies suggest that forearm muscle thickness measurements are a tolerable and less demanding assessment to use for older adults, and ultrasound estimated appendicular lean mass from the forearm muscle thickness may be a useful indicator for evaluating muscularity in older adults. Although additional research is needed, our recent work along with others noted within the Nijholt et al. review may be useful with the development of ultrasound evaluation for health screenings as well as for the primary diagnosis of sarcopenia.

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The authors certify that they comply with the ethical guidelines for authorship and publishing of the Journal of Cachexia, Sarcopenia and Muscle.

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We feel encouraged by their response that ultrasound has the potential to play an important role in assessing muscle mass in daily practice in the future. The authors remarked that we included only two studies in our systematic review that evaluated the validity of ultrasound-derived prediction equations for the prediction of muscle mass in older adults.2 The authors elaborate on three other studies that indicate that forearm muscle thickness measurements could be used for the prediction of muscle mass in older adults. Although these articles provide additional information on the possibilities of muscle ultrasound for the prediction of muscle mass, we did not include these three articles in our systematic review because these articles were published later than the period included in our search,3,4 or did not meet our inclusion criterion for age.5

The authors’ suggestion of using forearm muscle thickness measurements for the prediction of muscle mass is interesting for daily practice. It is very promising that the size of peripheral muscles is associated with (whole body) muscle mass. However, we do not fully agree with the statement that one site fits most. Despite the fact that the current definitions of sarcopenia and malnutrition focus on the assessment of (whole body) muscle mass,6,7 we would like to emphasize that the assessment of peripheral muscles is of utmost importance. It has previously been observed that the loss of muscle mass is not uniform across all muscles.8 In general, the loss of muscle mass of the lower limbs is a consequence of inactivity, whereas the loss of muscle mass in the upper limbs is more prone to nutritional depletion.9 This illustrates the importance of assessing peripheral muscles. Peripheral muscles can be quantified using muscle ultrasound, but muscle ultrasound can also be used to qualify the muscle,
e.g., to assess the amount of intramuscular fat. This intramuscular fat results in increased echogenicity, i.e., the reflectance of the emitted ultrasound signal, and is associated with decreased muscle function in older adults. These findings implicate that not only the size of the muscle matters, but also the composition of muscles needs to be assessed.

In summary, we agree with Abe, Loenneke and Thiebaud that ultrasound has high potential for the assessment of muscles in daily practice. However, we believe that assessing peripheral muscles is equally, or may be even more, important than the prediction of muscle mass. Therefore, we propose a paradigm shift from the assessment of (whole body) muscle mass to quantifying and qualifying peripheral muscles.

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