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Agreement between rectus femoris thickness by ultrasound and skeletal muscle mass by bio-electrical impedance analysis: a pilot study

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Aim

Assess the agreement between muscle thickness of rectus femoris (RF) by ultrasound and skeletal muscle mass by bio-impedance analysis in an older population.

Conclusion

Ultrasound measurement of RF muscle thickness showed an acceptable agreement with skeletal muscle mass assessed by BIA in our sample of older adults.

Background

Sarcopenia is a major problem and is common in community-dwelling elderly. Therefore, early screening of muscle mass and strength is important for the prevention of sarcopenia. Computed Tomography (CT), Magnetic Resonance Imaging (MRI) and Dual X-ray Absorptiometry (DEXA) are considered reference methods to measure muscle mass. However, these methods are expensive, time consuming, not portable, and trained health care specialist are needed. Moreover, in case of CT and DEXA, the participant is exposed to ionizing radiation.

For daily practice, there is need for low cost and easily accessable methods to assess depletion of skeletal muscle (SM) mass. Bio-electrical impedance analysis (BIA) is often used to estimate body composition and can predict SM mass. Besides, BIA is easy to use, repeatable and a low cost method.

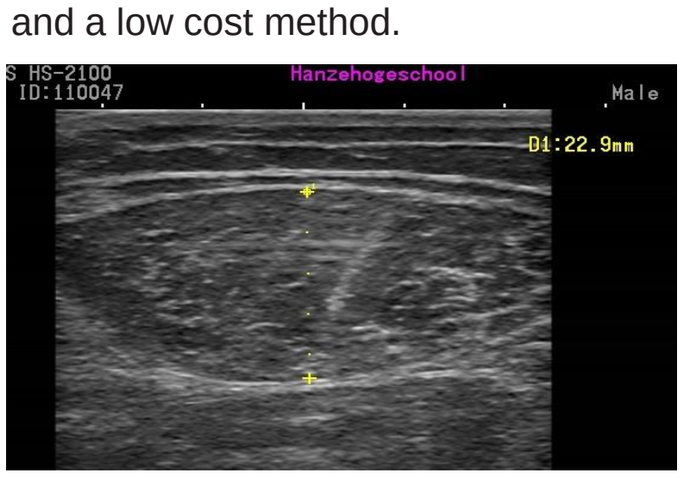


Figure 1. Measurement of muscle thickness of the rectus femoris

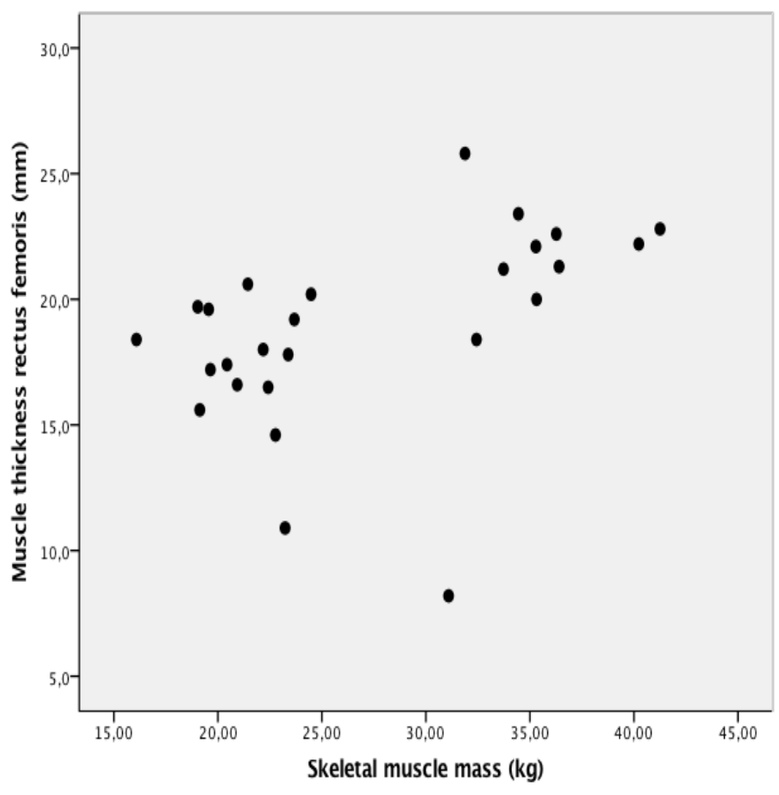


Figure 2. Correlation between RF thickness and SM mass.

Furthermore, ultrasound measurement is an upcoming and promising tool for estimating body composition, as it can assess site-specific loss of SM mass. Ultrasound measurement outcomes have been validated with MRI, CT and DEXA. However, little is known about the agreement between SM mass by BIA and muscle thickness of the rectus femoris (RF).

Results

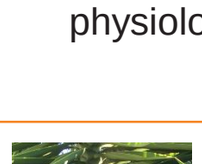
- Mean (±SD) RF thickness was 18.9 (±3.8) mm
- Median (Interquartile range) SM mass was 23.5 (20.8-34.7) kg.
- Spearman correlation between RF thickness and SM mass was moderately positive (r=0.611; P=0.001) (Figure 2).
- Kendall's W showed a strong agreement (W= 0.835; P=0.002).

Methods

- Twenty-six adults from the Hanze Health and Ageing Study were included.
- SM mass by BIA was estimated using the Janssen equation.[1]
- Muscle thickness of RF was assessed by analyzing ultrasound images from the right leg (Figure 1).
- Correlation between ultrasound and BIA was assessed with Spearman Rho.
- Agreement was determined with Kendall's coefficient of concordance (Kendall's W).

References

1. Janssen I, Heymsfield SB, Baumgartner RN, Ross R. Estimation of skeletal muscle mass by bioelectrical impedance analysis. Journal of applied physiology. 2000;89(2):465-71.



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