

Defining sarcopenia and myosteatorsis: the necessity for consensus on a technical standard and standardized cut-off values

With great interest we read the paper by Morel *et al.*¹ in the *Journal of Cachexia, Sarcopenia and Muscle*. The authors presented an interesting study on the impact of low skeletal muscle mass index (as a surrogate marker for sarcopenia) and low muscle density (as a surrogate marker for myosteatorsis) on patient survival after kidney transplantation. They performed measurements on cross-sectional computed tomography (CT) scans taken at the level of the third lumbar vertebra. We agree with the authors that the analysis of CT scans has the advantage of being able to not only provide information about muscle quantity but also its quality, contributing to a more accurate assessment of body composition (components) and related health risks.

We feel there is a need to emphasize one important aspect of the discussion. To date, there is still no consensus on standardized CT-derived cut-off values for low skeletal muscle mass and myosteatorsis, which impairs accurate data analysis, interpretation, and subsequent translation to clinical practice. Although some studies have presented cut-off values for low muscle mass^{2–7} and low muscle density,^{8,9} discrepancies exist between these cut-off values due to differences in characteristics of the study population or the techniques used to assess quantity and quality of muscle mass, forcing researchers and clinicians to continue determining cut-off values specific to their study population. Morel *et al.* made use of age-specific and sex-specific normality thresholds of 130 healthy subjects and used a standardized procedure for their CT examinations. The mean skeletal muscle index of healthy subjects found in their study slightly differs from that found in our cohort of almost 1000 living kidney donors (mean skeletal muscle index (in cm^2/m^2) is 53.1 ± 7.3 in men and 42.0 ± 4.8 in women in our cohort *versus* 54.8 ± 7.9 in men and 41.7 ± 5.5 in women in the cohort of Morel *et al.*), and mean muscle density is lower in comparison to our cohort for both men and women (mean muscle density (in Hounsfield Units) is 49.3 ± 7.4 in men and 47.6 ± 7.9 in women in our cohort *versus* 43.8 ± 7.7 in men and 37.0 ± 8.2 in women in the cohort of Morel *et al.*), possibly due to differences in for example slice thickness. Several studies report an influence of technical parameters on muscle density, in which a higher slice thickness

results in a lower muscle density and intravenous contrast and low tube current are associated with an increased muscle density.^{10,11} The impact of variances in these technical parameters on skeletal muscle area measurements seems clinically less important, but requires further research.^{10–12} Due to increased attention in clinical practice and research for muscle quality, and the effect on various outcome measures, we need to develop a technical standard and formulate clear cut-off values. Additionally, technical parameters should be reported in studies using CT for body composition analysis.

Healthy individuals undergoing CT as part of standard care, such as living kidney donors, provide an excellent opportunity to assess reference and cut-off values of sarcopenia and myosteatorsis, and future research and discussion should focus on establishing standardized procedures and achieve a proper validation.

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Conflict of interest

Lisa Westenberg, Marcel Zorgdrager, Alain Viddeleer, and Robert Pol declare that they have no conflict of interest.

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