

Sarcopenia: Diagnosis and Surveillance Amid Rising GLP-1 Agonist Use

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Background



Sarcopenia is a decline in muscle mass and quality associated with significant adverse health outcomes including increased mortality [1]. Sarcopenia is most common in the elderly population, however, this diagnosis is often overlooked for a variety of reasons, including difficulty obtaining an accurate assessment without advanced imaging such as CT, DEXA, or MRI [2]. Additionally these modalities impart radiation and are not portable. Recently, an association between loss of lean muscle mass and GLP-1 receptor agonists used for weight management and metabolic health has been identified. Surprisingly, this association is found in a younger age group and has increased the need diagnose and monitor sarcopenia to intervene with appropriate management strategies in timely fashion. This requires a safe, affordable, portable, and reliable test that can used to diagnose and monitor sarcopenia in increasing number of patients utilizing GLP-1 agonists to prevent deleterious metabolic effects in individuals who lose a significant portion of lean muscle mass [3].

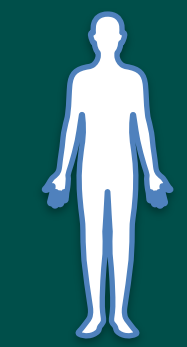
Methods



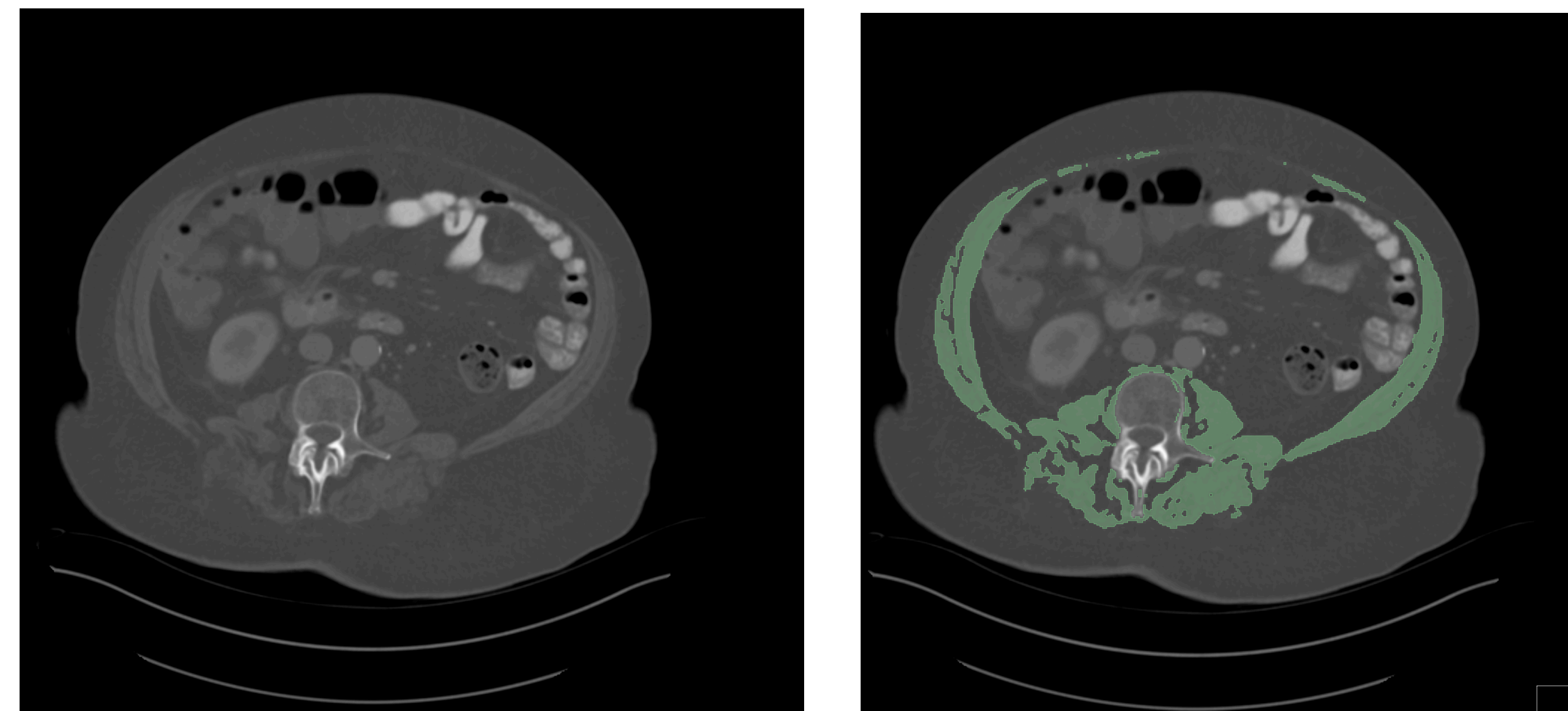
Ultimately the study involves collecting various metrics from multiple modalities as well as clinical testing. Patients who have had a CT abdomen and pelvis within the last 12 months and are suspected of having sarcopenia clinically were recruited. First these patients were administered a questionnaire called the SARC-F which evaluates for sarcopenia through a series of questions. Then patients performed a grip test 3 times on each side and performed the sit to stand test. These patients then had an ultrasound of the left and right rectus femoris (RF) as well as the brachioradialis (BR). Subsequently in the same area measurements were taken using a device which measures electrical impedance as well as a device which measures microwave reflection/scattering through the tissue. Following acquisition of the images various measurements are taken from each image. The measurements for each modality/test are summarized below very briefly:

MT = Muscle Thickness. FT = Fat thickness. ACSA = Anatomic cross-sectional area. HU = Hounsfield units. EI = Echo-intensity. PA = Pennation angle. FL = (Fascicle) Muscle Length. Z_{EIM} = Impedance. σ_{EIT} = Conductivity. ρ_{EIT} = Permittivity. θ_{EIT} = Phase

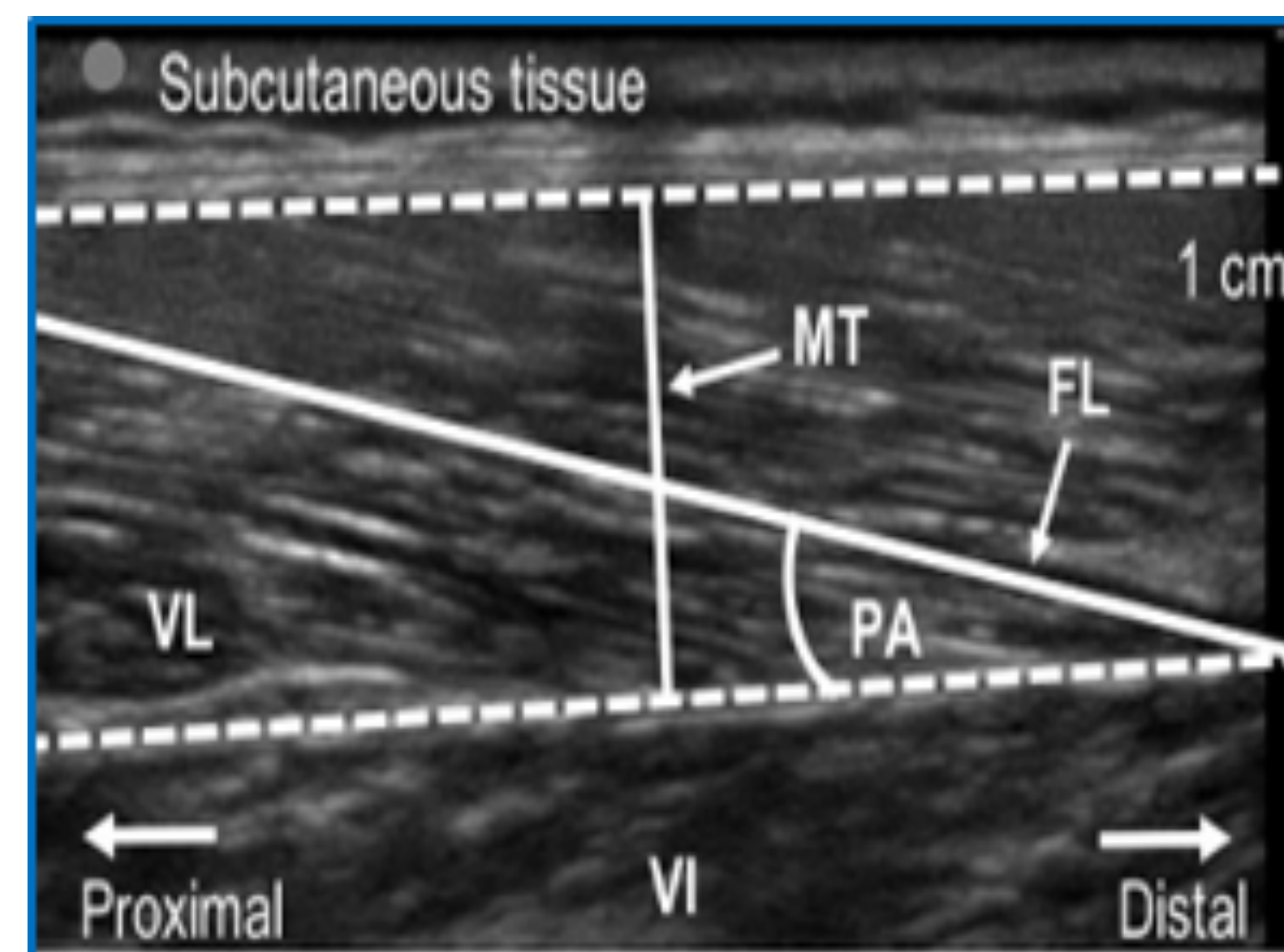
Results



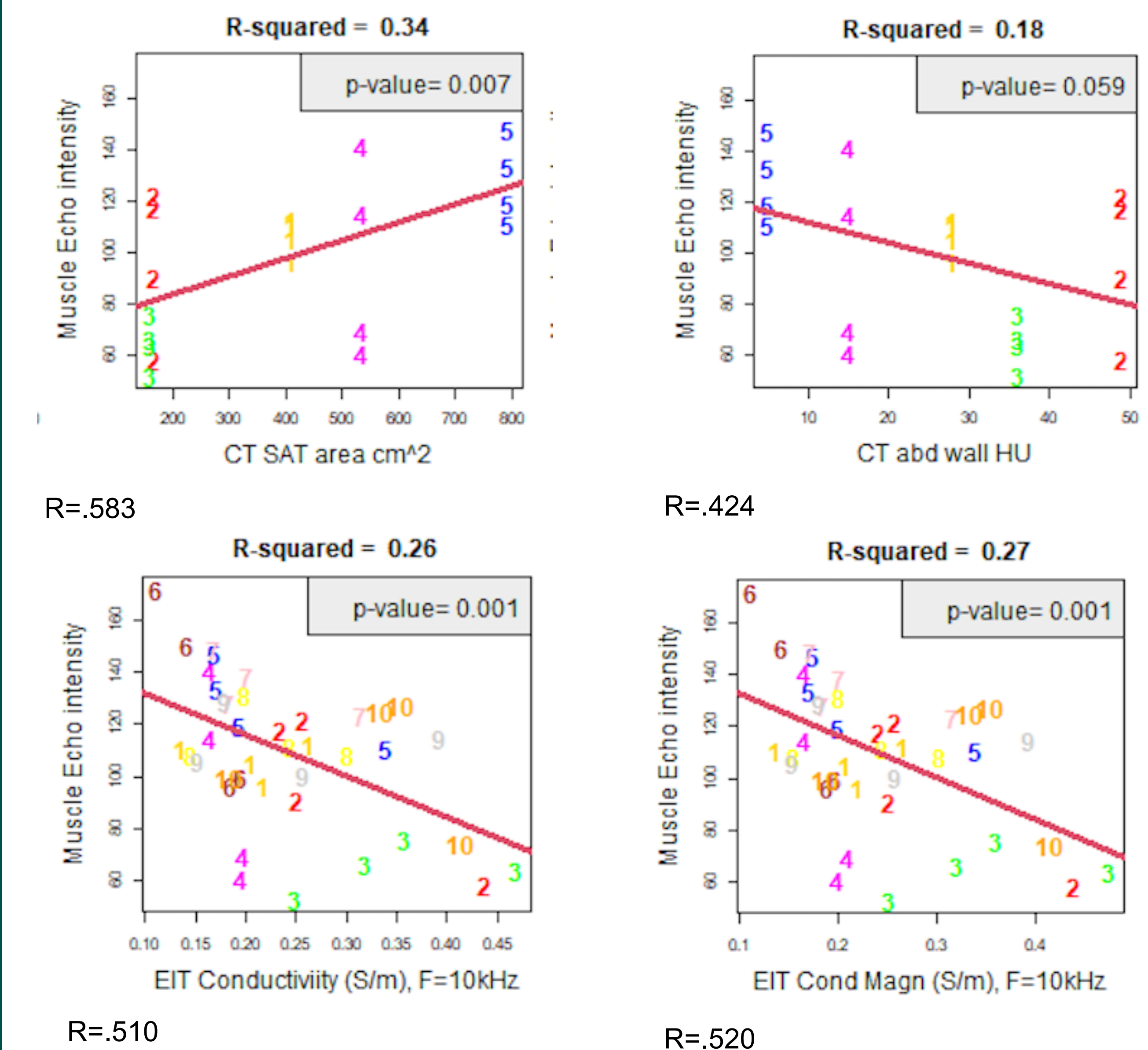
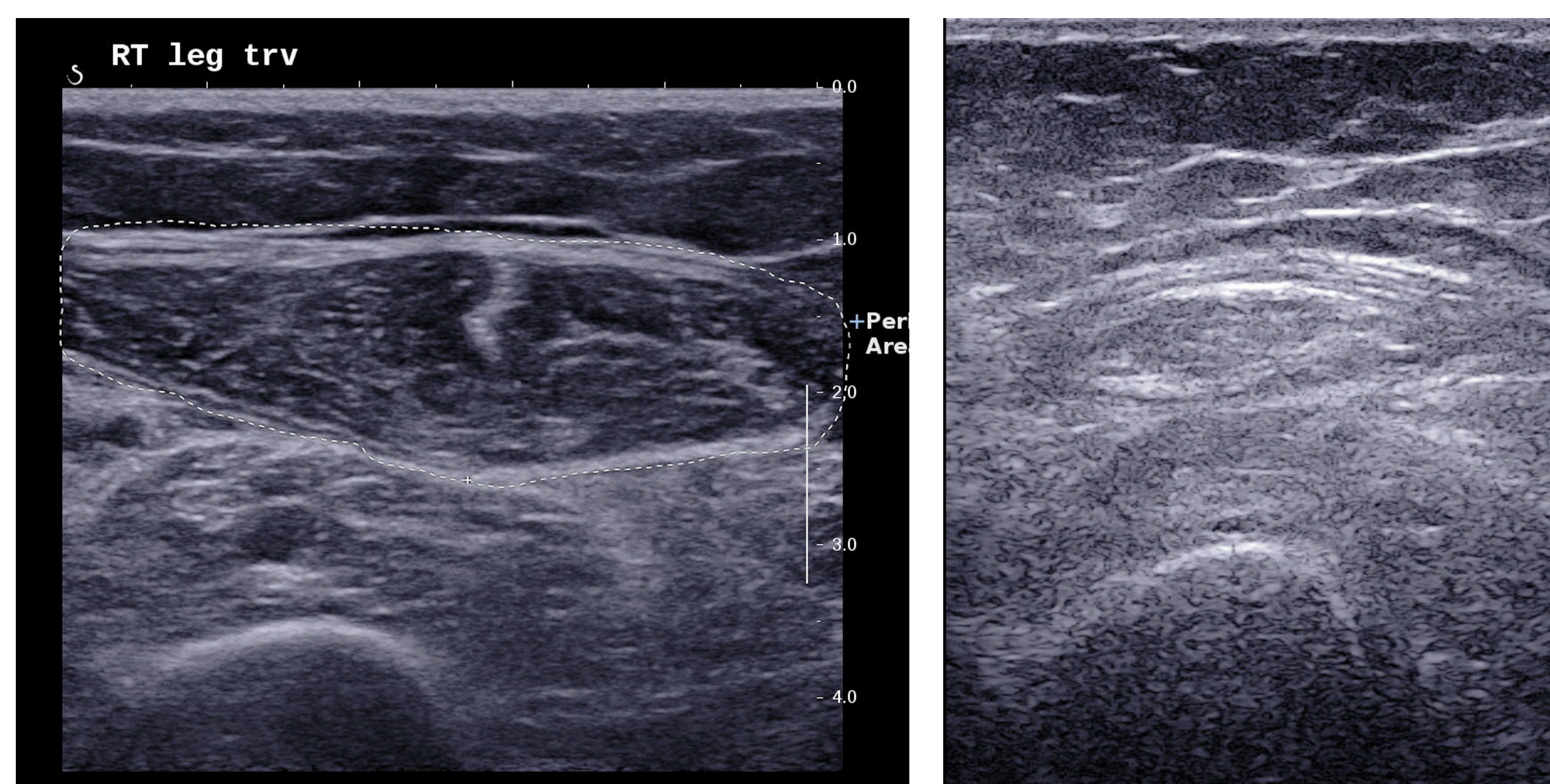
Sarcopenic Muscle Example (CT)



Ultrasound Measurements

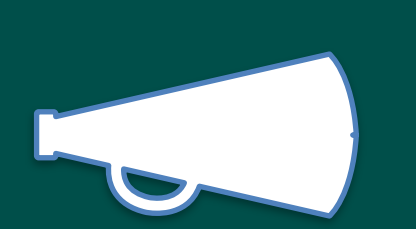


Healthy Muscle vs Sarcopenic Example (US)



With this being a pilot study we sought to elucidate variables worth studying further. Highlighted above are some of our interesting findings. There were also some promising findings from microwave imaging which were not included here. We hope to look into these relationships further with a larger sample size. CT (n=5). Portable modalities (n=10).

Discussion



Several variables appear promising for further investigation in a larger, powered study. Moving forward, we aim to standardize and refine our measurement protocols to enhance reproducibility. We also plan to explore combinations of variables and recruit healthy controls to strengthen comparative analyses across the different imaging modalities. As this was a pilot study, our focus was to identify feasible, quantifiable parameters and assess inter-modality relationships. Future work will focus on validation in a larger cohort and optimization of measurement procedures for clinical application.

References

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- 2.) Correa-de-Araujo R, Harris-Love MO, Miljkovic I, Fragala MS, Anthony BW, Manini TM. The Need for Standardized Assessment of Muscle Quality in Skeletal Muscle Function Deficit and Other Aging-Related Muscle Dysfunctions: A Symposium Report. Front Physiol. 2017 Feb 15;8:87. doi: 10.3389/fphys.2017.00087. PMID: 28261109; PMCID: PMC5310167.
- 3.) Filippatos TD, Panagiotopoulou TV, Elisaf MS. Adverse Effects of GLP-1 Receptor Agonists. Rev Diabet Stud. 2014 Fall-Winter;11(3-4):202-30. doi: 10.1900/RDS.2014.11.202. Epub 2015 Feb 10. PMID: 26177483; PMCID: PMC5397288.



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