Investigations on muscle composition and muscle power in older people

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Background
Age-related loss in muscle strength and power may lead to significant impairment in daily functioning [1]. The cause for this reduction has traditionally been explained by diminished muscle mass. However, decreased muscle mass is also often associated with an increase in intramuscular fibroadipose tissue [2]. The accumulation of this non-contractile tissue has been shown to impair the force-generating capacity of muscles in the elderly in experimental studies [3]. The relationship between muscle composition and clinical measures of daily function in older adults has not yet been investigated. This study used B-mode ultrasound to explore the relationship between quadriceps thickness, non-contractile tissue levels and clinical measures of quadriceps power in frail elderly.

Methods
B-mode ultrasound images of the thigh were acquired in 30 frail, nursing home residents (mean age 85.7±7.1 years, height 1.6±0.1 m, weight 65.5±15.4 kg). Muscle thickness of the rectus femoris and vastus intermedius were calculated, along with primary grayscale statistics, in which increased grayscale reflected accumulation of non-contractile fibroadipose tissue [4]. Muscle power was calculated using the Muscle Quality Index [5], a clinical measure reflecting the time taken for 10 repetitions of a sit-to-stand task. Relationships were investigated using simple correlations. The study received ethics approval and all participants signed informed consent.

Results
Rectus femoris muscle thickness was moderately correlated with muscle grayscale ($r=-0.48$, $p<0.01$). Only nine of the frail adults were able to complete the clinical sit-to-stand task. In these participants, there was a significant negative correlation between mean muscle grayscale and muscle quality index ($r=-0.78$, $p=0.01$) but no significant correlation between muscle thickness and muscle quality index ($r=-0.05$, $p=0.9$).

Conclusion
Reduction in muscle thickness in frail, nursing-home residents was accompanied by greater levels of intramuscular fibroadipose tissue as determined by ultrasound grayscale. Only fibroadipose tissue but not muscle thickness was associated with impaired muscle power.


The authors declare that they have no conflict of interest.