Introduction: Skeletal muscle is an important tissue for the maintenance of glucose and fatty acid homeostasis in the body, and being a prime target for insulin action is therefore linked to insulin resistance. Intramyocellular lipids (IMCL) and extramyocellular lipids (EMCL) have been measured extensively by Magnetic Resonance Spectroscopy (MRS) in diabetes and exercise physiology (1). However, the differences in lipid metabolism in upper and lower extremity skeletal muscles have not been investigated. In this study we employed localized 2D MRS (L-COSY) technique to investigate the lipid composition in flexor digitorum profundus in the forearm and soleus muscle compartment in lower extremity respectively.

Methods: Five male subjects with BMI ranging from 20 ± 5 kg/m² in the age group of (25 ± 5 years) participated in this study. All measurements were performed on a 3.0 T whole-body clinical MRI/MRS scanner using a 12cm T/R coil for forearm (Fig. 1a) and the T/R extremity coil (Fig. 1b) for lower extremity. 3mm thick slices of gradient echo images of forearm (Fig. 1c) and leg (Fig. 1d) was obtained for MRS localization. The IMCL content was determined within a single voxel (2.5 x 2.5 x 2.5 cm³) in respective muscle compartments by L-COSY technique (TR=2s, minimal TE=30ms, 40 t increments with 16 averages) with the total acquisition time of ~21 minutes.

Results:

Discussion: The skeletal muscle lipids accumulate from either increased uptake of fatty acid, or alternatively, from diminished fat oxidation. Given the different roles of arm and leg muscles and their different activation in daily life, it is possible that the skeletal muscle fatty acid kinetics is not equal in arms and legs. Our studies indicate a heterogeneity in the distribution of intramyocellular lipids in upper extremity compared to lower extremity.

Conclusions: We have demonstrated the differences in accumulation of intramyocellular lipids in upper and lower extremity. The forearms have lower accumulation of IMCL compared to lower extremity thereby being less prone to the development of insulin resistance.