2B05-1 The muscle fiber properties in mammals including human

Hirofumi MIYATA

Graduate School of Medicine, Yamaguchi University

Purpose: We investigated population and area of muscle fiber type in several mammals to demonstrate adaptation patterns of animal muscles and unique properties of human muscle.

Methods: Autopsy samples were corrected in whole body of 21 animals from mouse with 30g body weight to elephant with 3t body weight. In addition, needle biopsy samples from human Vastus lateralis (VL) muscle were obtained. Population and area in each fiber type were determined on some images stained with monoclonal antibodies to fast- and IIa- myosin heavy chain isoforms. Linear regression analysis between body weight (kg) and muscle fiber properties (population (%) and cross-sectional area (um^2)) in each fiber type were performed.

Results and Discussion: In the mean value of whole body muscle, the heavier animals had higher population and larger area of type I fibers. The significant relationships between body weight and type I muscle fiber population were more evident in forelimb than hindlimb muscle groups, indicating that forelimb muscles play a more important role for weight-bear function. In VL muscle, the population of type I fiber was the highest in human, and the area of type I fiber in human was identical to that of Elephant. These results suggest that the relative contribution of type I fiber to total muscle mass in VL is much greater in human than that in another animals for stand upright and walk bipedal.

Key words: fiber type, whole body, mammal

2B05-2 Development of multi-frequency impedance method of measuring muscle temperature noninvasively

Hideaki KOMIYA[1], Junichi MAEDA[2], Ishimatsu SUZUKI[3]

[1]*Utsunomiya Univ.;* [2]*Miyagi Univ. of Edu.;* [3]*Aichi Gakusen Univ.*

Objectives: We have been interested in clarifying muscle temperature during icing by using the electrical theory that electrical resistance depends on tissue temperature. We estimated noninvasively the changes in muscle temperature caused by icing using a multi-frequency impedance (MBIA) device. **Method:** The right calf was cooled by an ice bag, and the left was used as a control. Impedance was measured by the impedance method using a multi-frequency impedance device (MFBIA-07, Tanita) with a frequency range of 4 - 1024 kHz. The current electrode was made 7 mm wide, and was attached longitudinally to the calf. The current electrode was attached at distances of 3 cm, 4 cm and 5 cm from the sensing electrode. The temperature of the triceps surae was estimated by MBIA just below 3 cm, 4 cm and 5 cm just under the sensing electrode. **Results and discussion:** Impedance immediately after icing showed higher values than at rest at any frequency and electrode distance. Impedance of the muscle after icing was lower at a deeper position. The estimated temperature obtained at 5 cm depth decreased by -3.87 °C at 250 kHz. This was similar to the previously reported value of muscle temperature of -3.30 °C measured directly. **Conclusion:** The present method can be used to estimate muscle temperature noninvasively.

Key words: muscle temperature, multiple frequency impedance, icing, noninvasive measurement