1-C-08 Estimating the maximum voluntary contraction by the muscle stiffness at rest and during muscle contraction

Hideaki KOMIYA[1,4],Junichi MAEDA[2],
Ishimatsu SUZUKI[3]
[1]*Utsunomiya Univ.;* [2]*Miyagi Univ. of Edu.;*
[3]*Aichi Gakusen Univ.;* [4]*School of Med. Dokkyo Univ.*

Objectives: We measured the muscle stiffness accompanying stepwise muscle contraction, and found a close correlation between muscular strength and muscle stiffness. We tried to estimate maximum voluntary contraction (MVC) using anthropometry parameters and muscle stiffness which were obtained by submaximum efforts. **Methods:** We recruited 55 men from the students at our university. We randomly assigned participants into two groups, one composed of 35 participants and the other of 20 participants. Stepwise multiple regression analysis was performed on the 35 participants to estimate MVC. Independent variables were circumference of upper arm and muscle stiffness at rest and during contraction. Muscular strength measurement of biceps brachii was made to increase 2.5kg at a time from 2.5kg to 20kg. **Results and discussion:** A steeper straight line was observed in muscle tension exerted by contraction and muscle stiffness until 5kg. In 5kg or more of load, the inclination became gradual. The regression equation was MVC = 0.818(circumference of upper arm) + 2.282(difference of circumference at muscle contraction and expansion of elbow) + 1.977 (difference of the thickness at muscle contraction and relaxation) - 0.285(difference of the muscle stiffness at muscle relaxation and 5kg muscle contraction) + 5.246($r=0.864$, $p<0.001$). We observe high correlation in the cross-validation subsample($r=0.912$, $p<0.001$). **Conclusion:** We think that this method can estimate MVC in low muscular exertion, and it can apply to guessing the state of recovery in rehabilitation.

Key words: Non - invasive measurement, Pushing method, Muscle stiffness

1-C-09 Effects of cancellous and cortical bone microarchitecture by treadmill running differ between uphill, flat and downhill running

Keigo TAMAKOSHI[1], Yasue NISHII[2], Akira MINEMATSU[2]
1Department of physical therapy, Nagoya University Graduate School of Medicine
2 Department of physical therapy, Kio University

Purpose: It is reported that treadmill runnning inhibits bone loss in ovariectomized (OVX) rats. The loading on bone differs by an angle of inclination. However the effect on bone microaechitecture by the different slopes(upward, flat, downward) on tibial and femoral microarchitecture.
Method: Thirty female Wistar rats aged 8-week-old were divided into five groups randomly. One group had sham-operated(SHAM), and other groups had OVX. One of group was non-running as control(OVX) and other groups were running. Running groups divided into three groups; upward running(Up), flat running(Level), downward running(Down). Running groups started to run on treadmill at 20m/min, for 30 min, on 5 day/week, for 8 weeks at a week after the operation. Three different gradients were upward, +10%, flat, 0%, downward, -10%. After this experiment, tibias and femur in all rats were dissected out. Metaphysical region of tibias and femur were scanned with MicroCT, and those microarchitectures were measured with bone analysis software,TRI/3D-BON
Results: BV/TV and Tb.Th of Up and Level groups were significantly higher than those of OVX and Down groups , and those of Up group were significantly higher than those of Level group at the proximal tibias. BV/TV, Tb.Th and Tb.N of Up and Level groups were significantly higher than those of OVX group. Cortical section area of Up group was significantly higher than that of OVX group.
Discussion: Treadmill running with upward and flat slopes inhibited bone loss, especially in trabecular thickness. It was considered that upward slope running was effective on inhibition the conversion to rod shape of trabecular in the tibias and femur, and quantity of loading on bone was increased by upward slope.

Key Words: ovariectomized rat, treadmill running, bone microarchitecture