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RELATIONSHIP OF LOWER LIMB MUSCLE STRENGTH AND SERUM MMP-2 DURING 45 DAYS
OF BED REST

Abstract

The functional deficiency due to microgravity-induced muscle atrophy is the key restricting factor to long-term manned space flight. Therefore, a serological marker accurately reflecting the skeletal muscle dysfunction is important for dynamic monitoring and prevention of skeletal muscle dysfunction under weightless environment. Matrix metalloproteinase type 2 (MMP-2) is constitutively expressed in myoblasts and broblasts within normal muscle tissue and is overexpressed in the ECM in many pathological conditions in response to various initiating factors such as those occurring during inflammation, disease, and excessive exercise. However, if MMP-2 is related with muscle dysfunction remains largely unknown. In the present study, we evaluated the changes of thigh (quadriceps femoris and biceps femoris) and calf (gastrocnemius) muscle volume, isometric maximal voluntary contraction (MVC) and serum MMP-2 concentration of 8 subjects during 45 days of bed rest (BR). The average muscle volume was decreased significantly by 12.10% ($p < 0.01$). The average MVC strength was decreased significantly by 22.60% ($p < 0.05$). Serology test showed that the level of MMP-2 was significantly decreased during and after bed rest (post-BR) compared with pre-bed rest (Pre-BR) ($p < 0.05$). Interestingly, a significant linear correlation existed between concentrations of MMP-2 and isometric MVC strength of lower limb muscles during bed rest. R² values between MMP-2 and isometric MVC of knee extension (KE MVC) were 0.408 ($P < 0.01$). These results demonstrate that MMP-2 is related with decreased lower limb muscle function, and MMP-2 might have the potentiality to be developed as a molecular marker which could forecast physical fatigue during space travel.