SKELETAL MUSCLE PROPERTIES AND FATIGUE RESISTANCE OF QUADRICEPS MUSCLE IN HEALTHY SMOKERS

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Introduction: Although chronic obstructive pulmonary disease (COPD) is often accompanied by an increased skeletal muscle fatigability and changes in peripheral muscle morphology, it is unknown if cigarette smoking causes these changes.

Methods: Maximal voluntary torque and contractile properties of the quadriceps muscle were investigated in light (11 men and 12 women; mean (SD) cigarette pack years: 2.6 (0.5)) and heavy (8 men and 9 women; 20.4 (2.1) cigarette pack years) smokers using electrically evoked contractions. Control subjects (males n = 22; women n = 23) were matched for age and physical activity level with smokers. The fatigability of the muscle was determined during a series of electrically evoked contractions (1 s on, 1 s off for 2 minutes). In a subgroup (non-smokers n = 5; smokers n = 7) histological sections of muscle biopsies were stained for ATPase, to determine fibre type composition, and succinate dehydrogenase (SDH) as a measure of the oxidative capacity.

Results: Contractile speed and fibre type distribution did not differ significantly between smokers and non-smokers. The fatigue resistance of the quadriceps muscle was lower in smokers than non-smokers, both in terms of the decline in torque (P = 0.014) and the decrease in maximal rate of relaxation (P=0.008) during the test; there were no differences in fatigability between light and heavy smokers (P=0.592). The decline in fatigue resistance was not explicable by a decrease in force expiratory volume in 1 s or lower level of physical activity. The similar SDH staining intensity of individual muscle fibres in histological cross-sections from smokers and non-smokers suggests that the oxidative capacity did not differ between smokers and non-smokers.

Conclusion: The observation that the decrease in fatigue resistance was similar in short- and long-term smokers suggests that smoking has an acute effect on muscle function.

Keywords: Muscle Physiology, Smoking, Biomove session