Catecholamine response to exercise in individuals with different levels of paraplegia

Abstract

The purpose of this study was to investigate the effect of the level of injury on the serum level of norepinephrine (Nor) and epinephrine (Epi) at rest and after maximal exercise in individuals with paraplegia. Twenty-six male spinal cord-injured subjects with complete paraplegia for at least 9 months were divided into two groups of 13 subjects each according to the level of injury, i.e., T1-T6 and T7-T12. Serum Nor and Epi concentrations were measured by HPLC-ECD, at rest (PRE) and immediately after a maximal ergospirometric test (POST). Statistical analysis was performed using parametric and non-parametric tests. Maximal heart rate, peak oxygen uptake, and PRE and POST Nor were lower in the T1-T6 than in the T7-T12 group (166 ± 28 vs 188 ± 10 bpm; 18.0 ± 6.0 vs 25.8 ± 4.1 ml kg⁻¹ min⁻¹; 0.54 ± 0.26 vs 0.99 ± 0.47 nM; 1.48 ± 1.65 vs 3.07 ± 1.44 nM). Both groups presented a significant increase in Nor level after exercise, while only the T7-T12 group showed a significant increase in Epi after exercise (T1-T6: 0.98 ± 0.72 vs 1.11 ± 1.19 nM; T7-T12: 1.24 ± 1.02 vs 1.89 ± 1.57 nM). These data show that individuals with paraplegia above T6 have an attenuated catecholamine release at rest and response to exercise as compared to subjects with injuries below T6, which might prevent a better exercise performance in the former group.

Introduction

The sympathetic nervous system (SNS) controls cardiovascular responses during postural changes and exercise (1). Physical exercise can impose a significant stress on the organism, and the extent of the response depends on several factors such as exercise intensity and duration and training status of the individual (2-4). Catecholamines are both neurotransmitters and hormones, and play a dominant role in helping the individual respond to the stress of exercise (1,4). Among these responses are the capacity to control cardiac function and metabolism, to control blood flow in the working muscles, and substrate mobilization and utilization (4-6). During the course of a progressive maximal exercise test, peripheral catecholamines increase exponentially with increasing work-