Abstract: P3598

Cardiac Cycle - The effect of exercise on cardiac troponin release

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Topic(s):
Acute Coronary Syndromes: Biomarkers

Citation:
British Heart Foundation

Introduction

International guidelines recommend the use of low concentrations of high-sensitivity cardiac troponin to risk stratify patients with suspected acute coronary syndrome, however, troponin concentration may also rise due to physical exercise. Interpreting cardiac troponin concentration in this context is challenging because the magnitude and duration of troponin elevation following physical exercise is uncertain.

Purpose

To determine the effect of intensity and duration of physical exercise on cardiac troponin concentration.

Methods

We invited 10 physically active healthy volunteers (7 male and 3 female; mean age: 34+/−7) to attend 3 study visits, during which they underwent exercise on a stationary bicycle at prespecified intensities and durations. The first visit involved low intensity cycling (50-60% of the participant’s lactate threshold [LT]) for 60 minutes. During the second visit, participants cycled at high intensity (80-90% LT) for 60 minutes and during the third study visit, participants cycled at moderate intensity (60-70% LT) for 4 hours. High-sensitivity cardiac troponin I (hs-cTnI) concentration was measured at the start of exercise and every hour up to 6 hours during each study visit and subsequently at 1, 2 and 7 days after each exercise visit.

Results

Study participants had a median hs-cTnI concentration of 1.8 ng/L (interquartile range [IQR] 0.8 – 5.7 ng/L) at baseline. Cardiac troponin concentration was elevated following moderate- and high-intensity exercise (P=0.006 and P<0.001, respectively) but not following low-intensity exercise (P=0.137). Troponin concentrations were significantly higher following the shorter duration of high-intensity exercise (peak hs-cTnI concentration = 13 ng/L [IQR 6.5-27.1 ng/L]) compared to the longer duration moderate-intensity exercise (peak hs-cTnI concentration = 6.9 ng/L [2.9-7.9 ng/L]; P-value <0.001). Following both moderate- and high-intensity exercise, cardiac troponin concentration returned to baseline within 48 hours (Figure 1).

Conclusions

Our study suggests that elevation in cardiac troponin concentration is associated with the intensity rather than duration of physical exercise, and that exercise-induced troponin elevations resolve within 48 hours. These
findings have important implications for the interpretation of cardiac troponin in the risk stratification and diagnosis of patients who present with symptoms suggestive of acute coronary syndrome following physical exercise.