Physical exertion may cause high troponin levels

It is important to measure troponin levels when acute myocardial infarct is suspected. Many other factors that affect the heart can cause an increase in troponin levels, for example extreme physical exertion. Recent studies have shown that more normal physical activity can also lead to increase in troponin levels in healthy individuals.

During the course of acute coronary disease there is first an increase in troponin as a consequence of cell necrosis, followed by a fall. Measurement of troponin T or troponin I in repeated blood samples has become a cornerstone in modern diagnostic procedure in acute myocardial infarction. Increased troponin levels are not synonymous with acute coronary disease, but can also be seen in renal failure, toxic effects of medication and autoimmune conditions, and have been described in acute heart failure, tachycardia, myocarditis, sepsis and pulmonary embolism (1).

New, highly sensitive methods of measuring troponin levels have become available during the last couple of years. These methods provide good measurements well into the normal range, and have been characterised as having an analytic variation equal to or less than 10 % round the upper normal range for healthy individuals. The 99 percentile is used as the upper normal range limit, meaning that 99 % of healthy normal adults in a population will be within this limit. If troponin levels are to support the diagnosis of acute myocardial infarction, at least one measurement must be over the 99 percentile (2), and there must be significant increase/decrease over time.

There is great uncertainty about what constitutes a clinically significant increase or decrease in the troponin level. In order not to lose diagnostic specificity, the change must be greater than the variation that occurs with a combination of analytic and biological variation. The biological variation has been difficult to define. This may be due to several factors – for example failing to consider the factors in daily life that affect the excretion of troponin (3–5).

Troponin increase with physical activity

Extreme physical stress such as marathon and ultra-marathon races may lead to transitory elevation of troponin levels (6, 7). In more recent studies it has been shown that more normal physical activity can also lead to a troponin rise in healthy individuals. In a small study on adolescents, more than half of the participants developed troponin increase after basketball training (8). The same has been reported after a treadmill test (9, 10). In a study of cardiac healthy middle-aged health personnel who were subjected to their outer exercise limit on bicycles, almost half of them had a troponin rise in the hours after finishing an exercise ECG (11). In these studies the troponin levels exceeded the 99 percentile of the method in several individuals. If the patients report chest pain, these elevated levels can therefore formally fulfil the criteria for acute myocardial infarction.

The underlying mechanism for release of troponin after physical exercise has not been clarified. Myocardial necrosis is unlikely (12). Studies have shown that the maximum troponin levels come more rapidly after physical exercise (4 hours) (9, 11) than with ablation (8 hours) (13) and myocardial infarction. This indicates that the troponin demonstrated after physical exercise must come from cytosol and not from the thin filaments in the contractile apparatus as in myocardial necrosis. The T $^1/_2$ is given as 3–5 days (14).

We believe that the troponin part of cytosol could fit in with liberation of troponin from the filaments in normal breaking-down processes. Well trained individuals will have a larger contractile apparatus than those with no training, and they will therefore have larger amounts of troponin in their cytosol.

«Healthy individuals can develop a rise in blood troponin after moderate physical exercise»

Conclusion

Healthy individuals may develop a troponin rise in the blood after moderate physical exercise. In some cases these levels may exceed the decision levels used to diagnose acute myocardial infarction. This has consequences for the assessment of patients with acute chest pain. Patients with moderate troponin elevation and uncertain findings should therefore be asked whether they had been physically active around the time when the test was taken.

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