

# Troponin I and Its Clinical Significance

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## Introduction

**T**roponin I is one of the regulatory proteins of the troponin complex (troponin I, troponin C and troponin T) found in both cardiac and skeletal muscle. The letter I stands for its inhibitory character as binding is prevented between actin and myosin in relaxed muscle. It plays a significant role in holding actin-tropomyosin complex in place by binding actin in thin myofilaments. Binding of calcium to troponin C causes certain conformational changes, leading to troponin I dislocation and thus exposing binding site of myosin on actin, which leads to muscle contraction. It is frequently used in the diagnosis of acute coronary syndrome and myocardial infarction, and also serves as a prognostic marker in their management (1). There are three distinct forms of troponin I with tissue-specific expression patterns: 1. Slow-twitch skeletal muscle isoform troponin I, 2. Fast-twitch skeletal muscle isoform troponin I and 3. Cardiac troponin I.

209 amino acid residues are present in Cardiac troponin I (cTnI), which is present in cardiac muscle tissue. 26 amino acid N-terminal extension in cTnI differs it from other troponins versions. Phosphorylation occurs at this extension in response to beta-adrenergic stimulation is significant for cardiac inotropic property. Furthermore, it alters the protein's structure and the way that it interacts with both other troponins and anti-TnI antibodies.

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While focusing on heart failure, these modifications are highly significant. It has been observed that heart illness alters the phosphorylation pattern. A significant amount of phosphorylated cTnI is present in the patient's blood. cTnI has been recognized as a trustworthy indicator of damage to heart muscle tissue for years. CK-MB (previously known as Gold standard marker), as well as other indicators like LDH isoenzymes, total CK and myoglobin are all thought to be much less sensitive and specific than cTnI in the diagnosis of myocardial infarction (2). Besides myocardial infarction, Troponin I also acts as a key diagnostic marker in a variety of diseases like pulmonary embolus heart failure, subarachnoid haemorrhage, and chronic kidney failure, (3).

It is a technique used to determine quantitative level of cardiac troponin I in human blood plasma and serum. Primarily high-sensitivity troponin I testing is a chemiluminescence microparticle immunoassay which is used to diagnose myocardial infarction, helps in prognosis of acute coronary syndrome and spot the probability of (incidence and level of severity) subsequent various cardiovascular diseases (4).

In various pathological conditions like skeletal muscle disease and renal impairment, high sensitive troponin I has been found to respond clinically more effectively than high sensitive troponin T (5). Moreover, diurnal rhythm doesn't affect its specificity and sensitivity, which is significant especially when it is used in screening for cardiovascular disease.

The assessment of risk of future myocardial infarction, stroke, or heart failure development forms the cornerstone of contemporary CVD prevention. It is found that high sensitive troponin I when combined with the findings of clinical and diagnostic tests can more accurately identify a person's cardiovascular risk (6). It is capable of proactively identifying asymptomatic patients, both with higher and lower cardiovascular risk. Troponin I also reacts to therapeutic interventions. Drop in the level of troponin I is associated with the reduction in the risk of CVD.

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Troponin I test is highly sensitive to determine and categorize the cardiovascular risks in asymptomatic women and men. People may or may not be aware of recognised established cardio-vascular risk factors, such as obesity, metabolic syndrome, congenital factors, history of cardiovascular diseases, high blood pressure, smoking, pre-diabetes, diabetes, and sedentary lifestyle. (7). The high sensitive troponin I test should be incorporated into initial screening to increase the accuracy of predicting future cardiovascular events and to encourage patients to follow their doctor's advice on possible medication and lifestyle changes.

This might be a positive development for preventive care, as it is particularly relevant at the individual level, where clinicians must assess the significance of each risk factor and decide whether the patient requires therapy along with lifestyle modifications. The test can be used as a part of routine checkup programs or in conjunction with other clinical and diagnostic results as a stand-alone.

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