

# Increasing Cardiac Biomarkers in the Setting of Strenuous Exercise

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**Abstract** Exercise is recommended for both primary and secondary prevention of cardiovascular disease. Exercise-associated elevations of cardiac biomarkers can be present especially after prolonged and strenuous endurance exercise bouts but the exact mechanism and clinical significance is unclear [1]. This case report is of a patient with recent increase in exercise activity who presented to the emergency department with atypical symptoms and increasing cardiac biomarkers concerning for myocardial infarction. He was admitted and taken for left heart catheterization which showed non-obstructive coronary artery disease. The lack of awareness of this phenomenon may lead to inappropriate management of these patients.

**Keywords:** Exercise-induced troponin elevation, cardiac biomarkers, strenuous exercise, troponinemia, cardiovascular health

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## 1. Introduction

Exercise plays an important role in prevention and management of cardiovascular disease. Although regular exercise reduces risk of cardiovascular events, recent studies have documented elevations in cardiac biomarkers after prolonged strenuous exercise in healthy individuals [2]. Cardiac troponin is a specific marker of myocardial cell damage and is used for diagnosis of myocardial infarction but elevations can be seen following endurance exercise. In the absence of clinical symptoms of myocardial disease, these biomarkers could rather be linked to increased cellular permeability and early troponin release as a transient and acute response to intense physical exercise [3]. Although the exact mechanism is still unclear, it is important for clinicians to understand this phenomenon to facilitate the interpretation of troponin levels in the context of exercise in order to manage such patients appropriately and avoid unnecessary interventions [4].

## 2. Case Presentation

A 65 year old male with a past medical history of hypertension, hyperlipidemia and psoriatic arthritis presented with 2 hours of nausea and left shoulder pain with radiation to his neck that started after exercise. On presentation, his physical exam was unremarkable. Labs

on admission were notable for elevated troponin T of 0.22 and creatine kinase MB (CKMB) of 34. Electrocardiogram (EKG) showed normal sinus rhythm with left axis deviation without any ischemic changes. He was given aspirin and plavix load, started on a heparin drip and admitted for NSTEMI to the cardiac telemetry unit. Repeat cardiac enzymes 6 hours later showed an increasing CKMB of 81 and troponin T of 0.69. EKG was unchanged and the patient denied any chest pain. Bedside echocardiogram revealed no wall motion abnormalities with normal left ventricular function. His next set of cardiac biomarkers 6 hours later increased to CKMB of 93 and troponin T of 1.24 and he was taken for urgent cardiac catheterization. Left heart cardiac catheterization showed 40% stenosis of the proximal left anterior descending artery with no evidence of obstructive CAD. Later, it was revealed that the patient had started vigorous exercise the week before his admission which included weight lifting and high-intensity cardiovascular exercises.

Table 1. Laboratory data

	Creatine kinase (CK)	Troponin T	CKMB
Admission	584	0.22	34
6 hours post-admission	1022	0.69	81
12 hours post-admission	1229	1.24	93
24 hours post-admission	1176	1.06	67

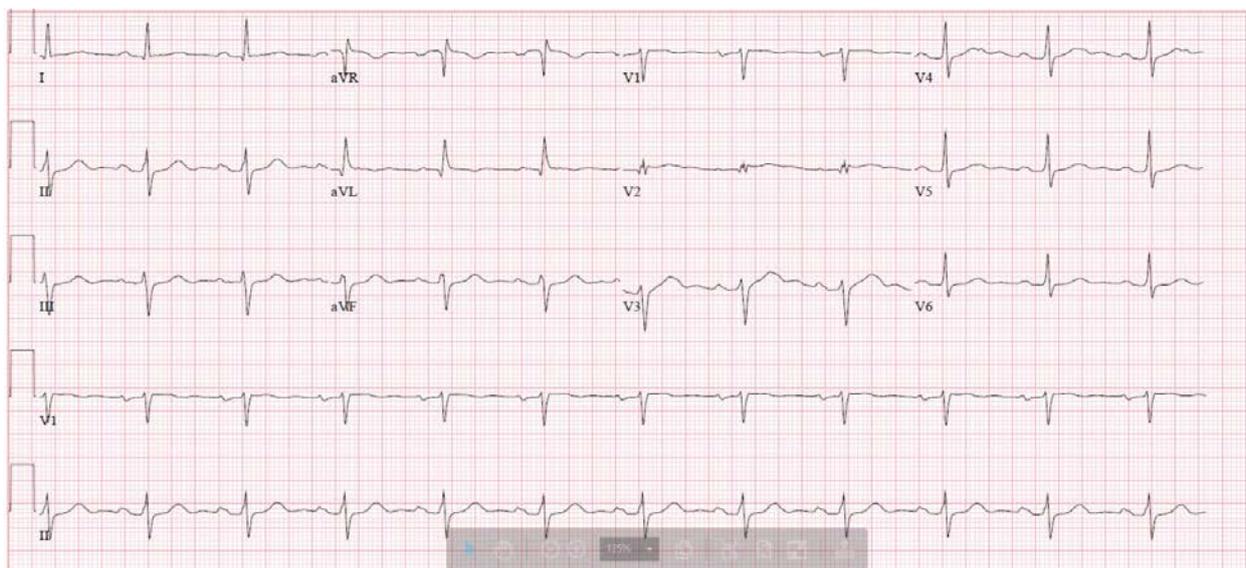


Figure 1. Electrocardiogram on admission

### 3. Discussion

When assessing patients with suspected coronary syndrome, physicians use cardiac biomarkers as sensitive markers of cardiac damage to guide clinical management. Physical activity causes an increase in oxygen demand and cardiac output which can lead to changes in blood concentrations of numerous laboratory variables. Typically, exercise-induced elevation in cardiac troponin decreases significantly within 24 hours after exercise and usually reaches normal values within this time [4]. In addition to cardiac troponins, physicians can use CK-MB and creatine kinase (CK) ratio to help guide decision making. A CK-MB to CK ratio of  $> 6\%$  is reported to be specific for myocardial injury, whereas a ratio of  $< 6\%$  is consistent with skeletal muscle damage or non-cardiac causes [5]. In this case, we presented a male who presented with atypical symptoms. He denied any chest pain and his echocardiogram revealed no regional wall motion abnormalities consistent with ischemia but due to increasing cardiac biomarkers, he was taken for urgent cardiac catheterization. Subsequently, his cardiac biomarkers trended down. His presentation was attributed to recent strenuous exercise in the absence of other causes. This case highlights how patients with such presentations can be clinically confusing for physicians. It is important to cautiously evaluate such patients and assess the clinical context carefully.

### 4. Conclusion

Patients presenting after exercise should undergo a comprehensive history and physical examination with attention directed to the presence of cardiovascular signs/symptoms and risk factors for atherosclerotic disease. If the suspicion for a cardiovascular event is low, clinicians should avoid unnecessary interventions and admissions of such patients. Additional studies are needed in such patients to understand the association of cardiac biomarkers and exercise to implement guidelines for management of such patients.

### Ethics approval and consent to participate

Not applicable.

### Consent for publication

Consent obtained at time of discharge.

### Availability of data and material

Not applicable.

### Competing interests

The authors declare that they have no competing interests.

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